THE IRON TRADE REVIEW

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More Foreign Business is Coming

Russia Needs Large Quantities of Rails—Corporation Blows in More Stacks—Pig Iron Market Stronger

THE pig iron market shows decided increase in strength. It has been slow to fall in line with the improvement in finished materials, but at present buyers are displaying anxiety to contract for the first half of next year and sellers are very slow to quote for delivery after Jan. 1. The sales of the past week have included 30,000 tons of basic in the Cincinnati district, 10,000 tons in eastern Pennsylvania and 5,000 tons at Pittsburgh. Foundries closely affiliated with the Willys-Overland Co. have taken 20,000 tons, mostly foundry grades. The southern situation is much stronger and throughout the country the tendency of pig iron prices is to advance.

The Steel Corporation has blown in five more furnaces and is now operating at 87 per cent of blast furnace capacity and 93 per cent of ingot capacity. The outlook for very heavy foreign business is favorable and prices on products exported are advancing. The opinion is expressed in well-informed circles that the contracts for rails to be offered American makers by Russia will be of larger tonnages than the mills will be willing to accept. Domestic rail business is rather light, orders placed in Chicago and Pittsburgh during the week amounting to from 10,000 to 12,000 tons.

Machinery

Unprecedented activity in inquiring for machine tools for making war munitions continues. The demand is for export and from domestic concerns engaged in the manufacture of munitions. In spite of the fact that early deliveries cannot be given, a very large amount of business was closed during the past week, including the sale of machine tools valued at more than $300,000 to an eastern concern which is about to go into the manufacture of high explosive shells. Many other companies are figuring on shrapnel and high explosive shell contracts. The demand for second-hand machines is also very active, particularly in the Chicago district. The purely domestic demand for machine tools shows slight improvement, but is still far below normal.

Earnings

The quarterly report of the United States Steel Corporation, showing the largest earnings for any quarter since that immediately preceding the panic of 1907, and the report of the Republic Iron & Steel Co. for six months, showing a gain of 62 per cent in earnings compared with the corresponding period last year, indicate that steel companies are approaching a time when earnings as large as those reported in the first three quarters of 1907 may be expected. Indeed they may already be earning as much as they did in the months preceding the panic of 1907, for certainly July will have much better earnings than June.

Bolts and Nuts

Some manufacturers of bolts have reduced discounts 5 per cent, and some manufacturers of nuts have advanced their quotations from $3 to $5 per ton, but these higher quotations have not been established. There is no doubt, however, that if the present activity of the bolt and nut market continues, higher prices will prevail.

Shapes and Plates

Large awards of structural contracts are not numerous, the principal one being 5,400 tons for the new city-county building at Pittsburgh, taken by the Jones & Laughlin Steel Co. Fabricators having contracts made some time ago at low prices are making bids for erecting at very low prices in order to keep their shops employed. In New York territory, the principal reliance of the structural shops is upon subway and elevated work.

Bars

The steel bar market continues very strong and inquiries for large tonnages of rounds for the manufacture of shrapnel are pending. Cold rolled shafting is strong and specifications are heavy, especially from automobile manufacturers.

THE OPEN HEARTH

Where He Went---A Personal Story

UNDER the above caption, William H. Ridgway has a delightful story in *The Ladies' Home Journal.* It begins with these two paragraphs:

A man famous the country over walked into his office one day and said to his associates:

"I am going away for a week or so and I do not want you or anyone else to know where I am. Don't worry about me—I shall be here when I get back." And he disappeared.

Then Mr. Ridgway describes the visit which the late brilliant Henry W. Grady, of Georgia, made to his mother shortly before he died, telling why he went and the effect that it had upon him. It is indeed a story well worth reading—one which will cause many to do a good deal of sober thinking.

It seems a far cry from the manufacturing of elevators and the writing of advertisements to the writing of human interest stories for *The Ladies' Home Journal,* but, after all, it is not so far. If you have not already done so, take a look at the happy faces of the dozen children on advertising page 32 of *The Iron Trade Review* of last week and you will see that the man who wrote the "Hook 'er to the Biler" advertisement is capable of writinig the story about Henry W. Grady. There is the same love of humanity in both. A man often can show his real nature in writing advertisements as well as in doing other things.

A Wise Selection

GOVERNOR Martin G. Brumbaugh, of Pennsylvania, some time ago was invited by officials of the Panama-Pacific exposition, San Francisco, to select a man upon whom the exposition could confer an honor as being eminent in the life of Pennsylvania. The governor decided to let the choice rest with the editors of the state, asking them to name three men. From the answers received, he selected Dr. John A. Brashear, Pittsburgh, astronomer; John Wanamaker, Philadelphia, statesman and merchant, and Rev. Russell H. Conwell, of Philadelphia. Of the three, Governor Brumbaugh designated Dr. Brashear as the most eminent, describing him as "distinguished as a constructive scientist, widely learned, philanthropic, modest and capable, and of excellent character, an ideal citizen".

Dr. Brashear, oftentimes referred to as Pittsburgh's "first citizen", is president of the American Society of Mechanical Engineers. He is a manufacturer of astronomical and physical instruments. While he was forced to go to work early in life, he has received honorary degrees from Western University, now University of Pittsburgh, Princeton, Wooster, and Washington and Jefferson colleges. He is a fellow of the A. A. A. S., Royal Astronomical Society of Great Britain, past president of the Western Engineers' Society of Pennsylvania and the Pittsburgh Academy of Arts and Sciences and is a member of prominent astronomical societies in Great Britain, France, Belgium and Canada. For several years he was acting chancellor of the University of Pittsburgh.

Although Dr. Brashear is not directly associated with the steel trade, his selection by Governor Brumbaugh meets with the hearty approval of the iron industry of Pennsylvania. "Uncle John", as the most eminent citizen of Pennsylvania is referred to, is highly esteemed by officials of iron and steel manufacturers who credit the governor of Pennsylvania with having made a praiseworthy selection. Dr. Brashear is a warm personal friend of Andrew Carnegie, who, with other steel masters, has expressed appreciation of the doctor's generous contributions to science.

How Can the United States Benefit?

AS THE result of the making of vast quantities of munitions of war for European belligerents, will the United States be better prepared if compelled to go to war itself than if no manufacturing of this kind had been engaged in? This is an important question and we believe that it can be answered in the affirmative, for in increased equipment and in experience gained, this country already is much richer than it was a year ago. With such experience and equipment, munitions for our own armies could be turned out with much greater skill and expedition. The question as to how machine tools and other devices used in the manufacture of munitions could be utilized for our own needs in the future is not so easily answered.

A letter recently addressed to *The New York Times* by B. W. Peterson, president of the Dollar Savings & Trust Co., Wheeling, W. Va., has attracted some attention among manufacturers, particularly in the Wheeling district. Mr. Peterson believes that every machine or device in the hands of our manufacturers now, or that hereafter may be engaged in the production of implements of war or ammunition, should, when the demand for their products is past, be carefully stored and preserved for the use of the United States when needed, and not dismantled or adapted to other uses. "With this equipment at command," says Mr. Peterson, "we could safely carry a comparatively small stock of war materials for defense, because, when any international trouble was brewing that directly concerned us, we could summon to almost instant activity the full capacity of this ma-

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chinery to supply the materials for our defenders."

Mr. Peterson believes that this could be accomplished by congress at its next session, making provisions to lease and safely store such of these outfits as may be deemed expedient at a fair rental on their worth as machinery, to be appraised by a commission of United States army and navy officers, with option to purchase at any time at appraised values.

While it is true that if at any time in the near future this country should be involved in war, much of the machinery now being used for manufacturing munitions would be available, we very seriously doubt the advisability of attempting to store large quantities for possible need in the distant future. The principal objection to such a proceeding is that inventions are constantly causing radical changes in implements of war and ammunition and in the machinery used for their manufacture. Experience gained in the present war will undoubtedly result in very important changes in methods of fighting. Hence machinery stored now, or at the end of the war, would soon be almost useless. Another point is that machinery alone would be of little value in the event of war, for in order to turn out the engines of destruction, industrial organization of a high grade would be absolutely necessary. Organization cannot be stored, it must be built up, and if the United States should become involved in war, it would be compelled to depend upon the patriotism and ability of its manufacturers to perfect their organizations and to manufacture up-to-date munitions.

There is ground for difference of opinion on some of these subjects, but on one point all American citizens should be agreed, namely, that every contract made by an American concern with a foreign buyer of munitions should contain a clause providing that in the event of this country becoming involved in war with any other nation or nations, all obligations to carry out the contract should be immediately cancelled.

Sharing War Profits

THE industrial unrest which for a time threatened to be serious in the New England states has happily subsided to a large extent, due to the promptness and generosity with which some employers acted. At a time when newspapers are publishing so many glowing accounts of wondrous wealth to be made by the manufacture of munitions of war, and when the stock market is wildly excited by the amazing advances of so-called war stocks, and when the director of one company has admitted that the contracts taken by his company, amounting to $15,000,000, are likely to result in a profit of 33-1/3 per cent, it is not surprising that many employes are beginning to become restless and prepare to demand higher wages. Machine tool manufacturers in Cincinnati, by granting advances before they were asked for, have acted wisely. Similar action by other companies which are reaping rich rewards on foreign contracts would be just and would prevent a great deal of trouble.

Naval Advisory Board

SECRETARY DANIELS has invited eight scientific and technical societies to select two members each to act with Thos. A. Edison, Henry Ford and Orville Wright as a naval advisory board. The plan has been criticized as being rather cumbersome and it has been suggested by a New York newspaper that there will be rivalry among the members of the various societies for the honor of being named for a work of so great national importance. True, an advisory board of 19 is rather large, but there are numerous questions of widely different character on which advice is to be given. In this day of high specialization, one man, and not even two or three men, could advise the secretary as to all the problems connected with the upbuilding of the navy. The secretary is to be commended for appealing for advice to the great societies which he has named and we are not at all afraid that there will be any unseemly contest among the members for the honor of being selected.

Not a Political Question

THE attempt to make political capital by advocating the stopping of the shipment of arms and ammunitions to all of the belligerents, as proposed by Governor Willis, of Ohio, is one of the most ridiculous phases of present-day politics.

"Treat all alike!" shouts the governor. "Insist on the maintenance of strict neutrality!"

That is exactly what is being done and a change of policy cannot be brought about without violating neutrality. Even Bryan has admitted that. The United States is willing to sell any customer who knocks at its doors and intends to treat all alike.

The action of Horace S. Wilkinson, of the Crucible Steel Co., in telling some plain truths about his company as a means of stopping the inflation of its stock deserves heartily to be commended. No steel company or other legitimate enterprise has encouraged the wild speculation which recently has characterized the stock market. At the beginning of the present hysteria, President Schwab issued a word of warning and others have done likewise.

Prices Present and Past

Quotations on leading products July 28, average for June, 1915, average for April, 1915, and average for July, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices July 28. 1915.	Average for June, 1915.	Average for April, 1915.	Average for July, 1914.
Bessemer pig iron, Pittsburgh..	$15.20	$14.58	$14.55	$14.90
Basic pig iron, Pittsburgh.....	14.20	13.54	13.45	13.90
No. 2 Fdy. pig iron, Pittsburgh	13.70	13.45	13.45	13.90
Northern No. 2 Fdy., Chgo....	13.00	13.00	13.00	14.00
Lake Superior Charcoal, Chgo..	15.75	15.25	15.75	15.75
Malleable, Bessemer, Chgo.....	13.00	13.00	13.00	14.00
Southern No. 2, Birmingham...	9.50	9.50	9.50	10.00
Southern Ohio No. 2, Ironton.	12.50	12.50	12.75	13.00
Basic, eastern Pa.....	14.25	13.75	13.25	14.00
No. 2X Virginia furnace.....	12.50	12.50	12.50	12.50
No. 2X foundry, Philadelphia..	14.50	14.25	14.25	14.75
Ferro mang., Balt., (prompt)..	98.00	105.00	78.00	37.50
Bessemer billets, Pbgh.....	22.00	19.87	19.50	19.30
Bess. sheet bars, Pbgh.....	22.50	20.37	19.60	20.20
Steel bars, Chicago.....	1.49	1.39	1.39	1.28
Steel bars, Pittsburgh.....	1.30	1.20	1.20	1.11
Iron bars, Philadelphia.....	1.22	1.17	1.17	1.17
Iron bars, Cleveland, local del'y.	1.20	1.20	1.15	1.20
Iron bars, Chgo. mill.....	1.20	1.15	1.15	1.05

	Prices July 28. 1915.	Average for June, 1915.	Average for April, 1915.	Average for July, 1914.
Beams, Chicago	$ 1.49	$ 1.39	$ 1.36	$ 1.28
Beams, Pittsburgh	1.30	1.20	1.15	1.11
Beams, Philadelphia	1.359	1.359	1.309	1.25
Tank plates, Pittsburgh.....	1.20	1.15	1.11	1.11
Tank plates, Chicago.....	1.44	1.31	1.28	1.28
Tank plates, Philadelphia.....	1.359	1.359	1.309	1.25
Sheets, blk., No. 28, Pittsburgh	1.75	1.80	1.80	1.80
Sheets, blue an., No. 10, Pbgh.	1.35	1.35	1.30	1.35
Sheets, galv., No. 28, Pbgh....	4.50	4.46	3.30	2.75
Wire nails, Pittsburgh.....	1.60	1.55	1.59	1.51
Connellsville fur. coke contr...	1.75	1.65	1.65	1.85
Connellsville fdy. coke, contr...	2.25	2.25	2.25	2.29
Heavy melting steel, Pbgh....	11.75	11.75	11.90	11.55
Heavy melting steel, east'n Pa.	12.50	11.25	11.25	10.50
Heavy melting steel, Chgo.....	10.75	9.37	9.30	9.50
No. 1 wrought eastern Pa.....	13.50	12.50	12.50	12.00
No. 1 wrought, Chgo.....	9.00	8.75	8.55	9.00
Rerolling rails, Chgo.....	10.25	10.00	9.85	11.25
Car wheels, Chgo.....	11.00	9.87	9.80	11.00

(For Additional Prices See Page 242.)

Pig Iron Market is Much Stronger

Round Tonnages of Basic Bought in East and Cincinnati District—Melters More Anxious to Cover for First Half of Next Year

Chicago, July 27.—Decided strength in all departments of the pig iron market is the feature at present. Southern iron is showing more signs of gaining a better position and most interest in the market is directed toward this product.

The announcement last week that one interest was nearly sold up and would sell nothing further for last half under $10.50, Birmingham, has been followed by others advancing their prices to $10 or more for last half delivery. A second large southern interest in the Birmingham district had refused $10, Birmingham, on 400 tons of No. 2 foundry in a territory close to Chicago. The Tennessee Coal, Iron & Railroad Co. is out of the market on basic iron and all quotations have been withdrawn, the steel works of the United States Steel Corporation requiring the entire output. Some sales at $9.75, Birmingham, were made by one interest early last week, but this quotation appears to have disappeared entirely.

Some inquiry for next year's delivery on southern iron is being received but makers are not inclined to quote that far ahead, although one has named $11, Birmingham, for first quarter. Southern Ohio iron has been quoted at $13.25 for first quarter and $13.50 for second quarter, for malleable and No. 2 foundry. Northern iron is not quoted above $13, Chicago furnace, although elements of strength have been added to the situation in the past few days and at least one interest is on the verge of advancing its quotation to $13.50, Chicago furnace.

The present inquiry is somewhat less in total tonnage, largest buyers apparently having protected themselves and inquiry now in hand, while from numerous buyers, is for small lots.

Order books of northern makers are in most comfortable position as total sales recently have been large and active furnaces are well sold up for last half. Preparations are being made tentatively for adding further capacity if the situation proceeds far enough to make this advisable.

Activity in the steel market has had a tendency to remove from the merchant market the excess iron from steel stacks which has been a factor through recent months in keeping quotations low.

Pig Iron Prices Advancing.

Pittsburgh, July 27.—All grades of pig iron are strong and this is particularly true of bessemer and basic. Foundry iron has developed a distinctly better tone the past week. Gray forge is also strong and is quoted at $12.50 to $12.75, valley. Steel making grades have advanced 25 cents. Bessemer is firm at $14.25 and some large sellers are quoting as high as $14.50, valley; the former level is asked even on export business. Basic is held at a range of $13 to $13.25 with the former figure ruling. The Colonial Steel Co., Colonial, Pa., has closed for 2,500 tons of basic at $13.00, valley. The purchase was made from Pittsburgh brokers. There have been some sales of this grade the past week at $13.25, valley. The Westinghouse Electric & Mfg. Co. has not yet closed on its inquiry for 10,000 tons of foundry iron. Practically no sales of this grade were made last week. No substantial inquiries for next year are out for this iron. One inquiry for 500 tons of malleable for the last half has just been put out in this district. It is now reported that two sales of bessemer iron last week totalled 2,000 tons, instead of 800 tons. Part of the iron is for export. The sales were made at $14.25, valley. The Crucible Steel Co. has closed for about 5,000 tons of basic iron for its eastern plant, finding it more desirable to do this than to ship iron from its stock at Midland, Pa. Only three blast furnaces are idle in this district, two of them being Corporation stacks. One is the Edith and the other is the Neville Island furnace. The third idle furnace is that of the Jones & Laughlin Steel Co., which is being relined and

(*For complete prices see page 242.*)

it is understood that this blast furnace will be blown in about Aug. 1.

Prices Hardening

Philadelphia, July 26.—The pig iron market in this territory shows an unmistakable hardening tendency and higher prices have been done by some furnaces than those ruling a week ago. In a few scattered cases, small tonnages of No. 2X foundry have sold at as high as $14.50, furnace, or slightly higher than $15.29, delivered in Philadelphia. This figure has been done by two furnaces. Other smelters have made sales of small tonnages at $14, furnace, and higher. While inquiry for all kinds of foundry grades is active and more general, the tonnages involved are not large. The most interesting of the sales during the week was one involving 10,000 tons of basic. This tonnage was taken by the same steel company which in last week's issue of *The Iron Trade Review* was alluded to as having closed for 4,000 to 5,000 tons. The price paid on the 10,000 tons, however, was an advance of 25c over the price in the previous transaction, figuring out to between $13.90 and $14, delivered. Following this important transaction, the market on steel-making iron has been advanced and it is believed no basic now could be had at less than $14.25, delivered. One small tonnage, 500 to 1,000 tons, already has been sold at the latter figure. Standard low phosphorus pig iron continues to be held firm at the advanced prices previously reported. In fact, there has been shown some disinclination to sell. Demand for low phosphorus is good. Sales of Lebanon low phosphorus during last week totaled between 2,000 and 3,000 tons. A number of inquiries for foundry iron for first quarter delivery have come out, but the furnaces are not quoting so far ahead. It is thought likely No. 1 Swedeland furnace will be blown in in two or three weeks, as the relining is proceeding rapidly.

Prices Advance

Cincinnati, July 27.—A large melter in this territory has purchased about 30,000 tons of basic iron for delivery over the remainder of the year. The pig iron market is much stronger, and prices in both the south and southern Ohio have been advanced. Southern No. 2 foundry is now being held at from $10 to $10.50, Birmingham basis, for last half shipment, several stacks being firm at the higher figure. No quotations are out for either the first or second quarters of next year, although several good inquiries for that delivery are pending. Southern Ohio No. 2 foundry is quoted at $13 for the last half, $13.25 for the first quarter, and $13.50 for the second quarter, all Ironton basis. Sales are mostly for light and scattered lots. The strength in the market is derived from the fact that consumption at present is equal to production, and producers have well filled order books for the last half. A large amount of speculative iron, aggregating about 50,000 tons, has been purchased during the past two weeks, but has not been put upon the market as yet.

Buffalo Prices Advance

Buffalo, July 27.—In the face of sales amounting to fully 15,000 tons of foundry grades and malleable iron and a considerable tonnage of basic, the furnaces of the Buffalo district have stiffened their prices so that now a minimum of $13 is being asked for No. 2X and malleable. The producers are adhering to grade differentials, although the range of prices is contracted. The maximum is the same as a week ago on high silicon grades, namely, $13.50. There has been no change in the price of charcoal irons. Malleable is quoted at $13 to $13.25.

Furnaces report that the inquiry continues to appear in good volume for this season of the year. Consumers are becoming more active, particularly among the steel foundries. While the increased operation does not apply to all of the foundries of the district, the improvement has reached some of the malleable melters. Foundries of the district reported among the consumers that are expanding their outputs include the Johnson Harvester Co., Batavia; the Syracuse Malleable Co., the Strong Steel Foundry Co., the Atlas Steel Casting Co. and Pratt & Letchworth Co., of Buffalo.

Car Company Buys

St. Louis, July 27.—One of the local car companies purchased 4,000 tons of northern iron last week, and quite a tonnage was sold in small lots. There is an inquiry out for 2,000 tons of northern and southern iron. Coincident with the increase in working forces in several of the east side foundries, the feeling for some improvement in pig iron conditions in the St. Louis market are more gratifying than they have been for some time. Southern iron is held at $10, Birmingham basis. Northern iron is quoted at $13 to $13.50, Chicago, and $13, Ironton.

Strong in the South

Birmingham, Ala., July 27.—The pig iron market is very strong. Inquiry is active. Stocks are getting lower every day and prices show a strong, conservative tendency to advance.

The Sloss-Sheffield Steel & Iron Co., Thursday, July 29, will blow in an additional furnace at Birmingham, making the fifth furnace to resume operations in the Birmingham district within 30 days.

The prevailing quotation for No. 2 foundry, Birmingham, is $10. No iron is being sold any lower and one sale for 300 tons of a special grade was closed during the week at $10.75. Predictions are that unless there are unforeseen developments, the market will reach $11 in another month. One sale of 40,000 tons at a basis of $10 for No. 2 foundry is reported, the buyer having speculative purposes.

The steel mills of the Tennessee Coal, Iron & Railroad Co. are operating at full capacity on rails and billets, although owing to certain conditions, the actual output is not more than about 85 per cent capacity for all rail production.

The whole industrial situation here is full of encouragement.

Rushing Deliveries

New York, July 27.—One of the most satisfactory features of the pig iron market in this territory is the extent to which consumers on all sides are anticipating deliveries on contracts. A large number of foundries which are consuming iron more rapidly than they had expected, consequently, are ahead of their contracts. While the past week has witnessed no transactions of special importance, there has been a good-sized volume of business made up of small tonnages. Several rather large tonnages, however, are under inquiry. One consumer is in the market for 5,000 tons of foundry iron for forward delivery. Another concern, with several plants in the east, is in the market for about 2,000 tons of foundry grades, mostly for delivery over the fourth quarter, but some for the first quarter of next year. Another consumer in this district wants 500 tons of foundry iron. A New Jersey consumer which has been negotiating on 1,200 to 1,500 tons is expected to close within a day or two. No action yet has been taken in reference to the foreign inquiries recently received in this market. Among sales last week was one to a consumer in this district involving 1,000 tons of low phosphorus iron. Prices are unchanged and the market reflects a firm tone.

Heavy Cleveland Sales

Cleveland, July 27.—One Cleveland firm has sold 76,000 tons of various grades this month, and others report a very comfortable volume of busi-

(*For complete prices see page 242.*)

ness. Foundries closely connected with the Willys-Overland Co. have purchased about 20,000 tons for delivery at Toledo, Pontiac and one or two other points for the remainder of this year and the first quarter of next. The iron is largely foundry grades, but includes some malleable. An inquiry for a large tonnage of basic from an Ohio river melter was received in this territory, but is understood to have been placed outside of this district, owing to the lower freight rates. Prices are strong and sellers are not anxious to sell for delivery after Jan. 1. The belief is general that higher prices for the first half of next year will soon prevail.

Black Sheets Are Higher

In the Chicago District, But Irregularities Have Not Disappeared in Ohio

Chicago, July 27.—Demand for black sheets has increased considerably and quotations have been advanced to 1.99c, Chicago mill. This is the first strength shown by black sheets in some time and probably results from increased use of painted sheets to take the place of galvanized, which are practically out of the market. Blue annealed sheets are also somewhat higher and sheet mills are much encouraged by the change in conditions. Galvanized sheets continue to be absent and the mills are not willing to quote on any recognized basis, although some mills will contract at a set price on an ironclad contract based on the present price of spelter with no provision for declines in that product.

Prices Higher

Pittsburgh, July 27.—Prices on all grades of sheets, except galvanized, are firmer. Blue annealed No. 10 is quoted at 1.35c to 1.40c, Pittsburgh, and No. 28 gage black sheets at 1.75c to 1.80c. Due to the weakened spelter market of last week, galvanized No. 28 has been reduced and is now quoted at 4.25c to 4.75c. Demand for galvanized material has decreased.

Better Sales

Cincinnati, July 27.—Sales of sheets are better, and prices have strengthened a little. Mills continue to refuse to quote galvanized except for prompt delivery, because of the uncertainity of the price of spelter and general conditions in the market. Black sheets No. 28 gage are given at from 1.80c to 1.85c, Pittsburgh basis, and galvanized No. 28 gage at from 4.50c to 5c, Pittsburgh basis.

Still Cutting Prices

Cleveland, July 27.—The sheet market is not in as satisfactory condition as most other lines. The long continued high price of spelter has resulted in many manufacturers of galvanized sheets going into the manufacture of black sheets and production has been greater than the demand. The natural result, irregularity in prices, has come, and the troubles of the sheet makers are increased by the very high price of sheet bars. While as low as 1.30c, Pittsburgh is still heard of, 1.35c and 1.40c are more generally quoted on No. 10 blue annealed.

Tin Plate Market Quiet

Pittsburgh, July 27.—No snap is shown in the domestic tin plate market and material can still be purchased at 3.10c. Fair increase for export shipment contiues to be made.

Cast Iron Pipe

Covington, Ky., Awards 3,500 Tons to Leading Company

Chicago, July 27.—The United States Cast Iron Pipe & Foundry Co. has been awarded 3,500 tons at Covington, Ky., which is about the only business placed in this territory recently. Bids will be opened at Wellington, O. July 31 on 200 tons, at Ogden, Ia., July 30 on 173 tons and at Miamisburg, O., today on 120 tons. Bids were opened at Cincinnati, Monday on 500 tons of high pressure pipe.

Moderate Improvement

New York, July 27.—Business is a little better in the cast iron pipe market, but it is estimated that the pipe foundries generally are not operating at more than 60 to 70 per cent of capacity. In view of this situation, and in the light of past experience, it is rather surprising to note that p ices on cast iron pipe, while they still are low, are being maintained with great firmness. The ruinous price cutting which formerly was constantly in evidence in the pipe market has been lacking during the past few months, this being reflected in recent public openings. On 1,450 tons of 6, 8 and 12-inch pipe for which the commissioners of the District of Columbia opened bids on July 19, the lowest price was $22.10 per ton, delivered, which was quoted by the Lynchburg Foundry Co. In the opening at Little Falls, N. Y., on the same date, on 1,370 tons of 4 to 10-inch pipe, R. D. Wood & Co. were low at $22.75, delivered. At an opening on 665 tons of 6, 8 and 10-inch at Oswego, N. Y., M. B. Crawford & Son were low at $23.84, delivered. Pipe makers say that private lettings are rather scarce, and as a rule involve 100 tons or less.

Maywood, N. J., opened bids on July 26 for 380 tons of 12 to 20-inch pipe.

(For complete prices see page 242.)

Coke Demand

Is Increasing and Prices Are Somewhat Firmer

Pittsburgh, July 27.—Demand for coke has increased and the market is somewhat firmer. Ovens are operating at better capacity and higher figures on all grades are expected to prevail soon. Spot furnace and foundry coke show more activity than existed early last week. Connellsville furnace coke is quoted at $1.75 to $1.80. Production last week rose to 371,000 tons, according to the *Connellsville Courier*, an increase of 30,000 tons over the previous week.

Coke Quiet

Cincinnati, July 27.—The coke market has quieted down after a very busy month in June. The majority of foundries in this territory have closed for a year's requirements beginning July 1, and furnaces in blast have recently purchased sufficient fuel to run them well into the last quarter. Several stacks are contemplating blowing in in the south and southern Ohio, and will need new supplies of coke. Prices are unchanged in the Wise county, Pocahontas and New River districts.

Dull at St. Louis

St. Louis, July 27.—Coke remains dull, although prices have stiffened somewhat, owing, it is said, to unsettled labor conditions. Connellsville 72-hour foundry coke is quoted at $2.50 to $2.75.

Attractive Pipe Orders

Pitssburgh, July 27.—Mills in western Pennsylvania and eastern Ohio have taken orders the past week for 15 miles of 12-inch and 10 miles of 10-inch pipe, involving 2,000 tons for shipment to the southwest; seven miles of 12-inch, calling for 600 to 700 tons for delivery in western Pennsylvania and seven miles of 8-inch, involving 350 tons for Oklahoma buyers. Several other orders of 100 to 200 tons have been closed.

Steel Bars Very Strong

With Mills of Leading Makers Falling Farther Behind in Deliveries—Bar Iron Dull

Buffalo, July 27.—Mills and agencies report that the delivery situation is becoming more difficult to meet. Orders against contracts continue to come in and the unfilled order tonnages are piling up at a greater rate than the mills are able to take care of.

Appeals are being made to customers to anticipate their requirements in order that the mills may be able to get out the material for them when needed. The larger consumers realize the situation, it is said, but the carload buyers and smaller users seem to doubt the fact that the mills are crowded beyond their capacity or fail to realize the situation that has developed. Some of the producers have enough business on their books, if specified against, to keep them going over the remainder of the year and are consequently not looking for more new business.

Some Refuse to Quote

Pittsburgh, July 27.—The market for steel bars has been established firmly at 1.30c, Pittsburgh, and some mills are refusing to quote on this material. It has been estimated that perhaps 60 per cent of orders for bars is for war material. Domestic business continues to show improvement, however.

Still Inquiring for Rounds

Philadelphia, July 26.—The volume of inquiry for rounds for making shells of all kinds and sizes continues to swell in volume. One large maker last week quoted on between 200,000 and 300,000 tons of shell rounds, from 3 to 6 inches in diameter. On this business the prices asked generally range from 2½c to 3c, Philadelphia, and one mill has asked higher even than 3c. The bar market is exceedingly firm all around.

Steel Bars Unchanged

Chicago, July 27.—Conditions in the market for steel bars are strengthening continually and specifications are being received steadily from those users who are covered by contracts. The market apparently is gaining firmness at 1.49c, Chicago mill, although new bookings are not many, users for the most part having covered at $1 per ton less.

Bar Iron Firm

Chicago, July 27.—Bar iron continues to meet small demand and users apparently have not found a need for added tonnages. The quotation remains firm at 1.20c, Chicago mill, but in spite of slack order books, mills are not anxious to take on large tonnages at this figure, as scrap has advanced materially and the cost of making promises to be greater.

Strong at Cleveland

Cleveland, July 27.—The bar situation continues very strong. All of the leading makers are well supplied with orders and prices are firmly adhered to. Locally, the Upson Nut Co. is one of the busiest plants in the city, and the Empire and Union mills are also making steel bars. The demand for bar iron is extremely light. Bids will close Thursday for the deck of the superstructure for the Clark avenue bridge now being built. About 500 tons of steel reinforcing bars will be required.

Hoops, Bands and Shafting

Pittsburgh, July 27.—The forecast made last week that the 66 per cent off figure on cold rolled shafting probably would be withdrawn at an early date, has materialized. Announcement was made today by the Columbia Steel & Shafting Co. that it had advanced its quotation to 65 per cent off on car lots and contracts and 60 per cent off on less than carloads. This is $1 above the previously prevailing level. All kinds of cold finished steel are up and the market is strong with orders coming to mills from all sections. Bookings by prominent makers are in excess of the capacity and it seems inevitable that deliveries will become extended. If business continues at the present rate, some makers think shipments will be deferred three months before long. Leading producers have established the hoop and band market firmly at 1.30c. Specifications and orders are reported to be heavy.

Heavy Demand for Shafting

Cleveland, July 27.—One of the strongest features of the market in this district at the present time is the heavy specifying on cold rolled shafting. While some of the demand comes from manufacturers having war contracts, a very large part of it is from automobile manufacturers. Prices are firm and showing a tendency to advance.

Demand for Plates Active

Buyers, Accustomed to Prompt Delivery During Dull Times, Are Rather Impatient

Philadelphia, July 26.—Platemakers say that while the past week has not witnessed the placing of any spectacular contracts, demand from all sources is exceedingly active and aggregates a large tonnage. A good deal of new business is placed every day and consumers are clamoring for deliveries on contracts. Mills are having great difficulty in making shipments, and this condition brings forth considerable complaint from consumers, who, the mills say, have been spoiled by the quick deliveries which have been available right along during the last couple of years. In several cases last week, consumers had to pay premiums of as high as $10 a ton on small tonnages for immediate shipment. It is unlikely that less than 1.30c, Pittsburgh, on third quarter, or 1.35c, Pittsburgh, on fourth quarter, could be done. A number of boats, referred to previously, still are pending.

Set Figure Higher

Pittsburgh, July 27.—Strength, which began recently to accumulate in the plate market, has developed to such an extent that leading producers have eliminated the 1.20c figure and established the level at 1.25c to 1.30c. Railroad buying has been small, but added inquiries have developed lately and with others in prospect, there has been a good effect on the market.

Plates Gain Firmness

Chicago, July 27.—Steel plates have not yet reached the level attained by bars and shapes and are quotable at 1.44c, Chicago mill, with indications that before long this product will be on an equality with other finished steel. Demands for car building in the west is assisting the market materially and in the east shipbuilders' requirements are an added factor.

(*For complete prices see page 242.*)

Sheet Plant Resumes

The Seneca Iron & Steel Co., Buffalo, N. Y., manufacturer of steel sheets, has resumed operations at its plant after a brief suspension due to labor difficulties.

Scrap Stronger

Improvement Reported in Several Leading Markets

Pittsburgh, July 27.—The scrap market has improved. With some middlemen asking $12.50 a ton for heavy melting steel and proportionately increased levels on other grades, it is believed the situation will continue to reflect more pronounced strength. It is true, however, that fair tonnages continue to be obtained at figures lower than those generally asked. Moderate activity is shown by low phosphorus scrap and several dealers are now asking $16 a ton for this material. Weak and irregular prices continue to characterize machine tool turnings. Shrapnel turnings are being offered by numerous concerns which are not ordinarily factors in this market. Bids will be opened on Aug. 3 by the Pennsylvania Railroad Co. on numerous kinds of railway scrap, involving approximately 14,000 tons, to be distributed from shops all along its lines.

Demand Active

Philadelphia, July 26.—While the old material market here was not featured by much buying on the part of the large steel mills, dealers say the demand generally is active and that they have no difficulty whatever in making sales. The chief trouble of the dealers is the scarcity of scrap of almost every description. It, therefore, is necessary for dealers and brokers to assist each other in filling contracts, and this condition accounts for the fact that most of the business current last week was in the form of trading. Prices are higher. Heavy melting steel has sold quite freely at $12.50, and now is held at $12.50 to $13. Wrought pipe, cast borings and machine shop turnings also have sold at advances. These descriptions are held, respectively, at $11.50 to $12, $8.50 to $9, and $8.75 to $9.25. No. 1 railroad wrought is held at $13.50 to $14.

Heavy Melting Advances

Buffalo, July 27.—All of the scrap dealers of the Buffalo district report an increase in the activity of the market. The leaders are heavy melting steel, which has been advanced from 25 to 50 cents per ton; low phosphorus steel scrap, the revival of its activity causing an advance of $1.50 per ton, and old steel axles, which have advanced $1 a ton. The minimum on heavy melting steel is now $11; on low phosphorus steel scrap, $14.50, and on old steel axles, $13.

The demand on the scrap yards has come from local users, out of town and eastern consumers. The dealers in the face of the rising market which has not as yet changed the quoted range on the other lines, are loth to sell large tonnages. They expect the market to advance with the increasing activity noted in pig iron and on the part of the foundries and mills.

Holding Stocks

New York, July 27.—The old material market in this territory is exceedingly strong, and a good deal of tonnage is moving. Demand for all descriptions is good, but is particularly active for heavy melting steel, of which dealers and brokers can sell all they have to offer. These interests, however, are not pushing any offers; in fact, there is a tendency to hold on to stocks. The dealers report they find it very difficult to buy scrap of all kinds. Prices are unchanged except in the case of No. 1 steel, which has been selling at $9.75 to $10, an advance of 25c per gross ton.

Mills Buy Scrap

Cincinnati, July 27.—Rolling mills are not only asking for good shipments of scrap on old contracts, but are closing for new orders. The feeling among dealers is very optimistic, and an advance in quotations is looked for in the near future. Jobbing foundries continue to buy very sparingly. Bundled sheet scrap, heavy melting steel, No. 1 busheling and No. 1 machine cast are the best sellers in the market. Quotations are unchanged from those that have held for several weeks.

Scrap is Stronger

Chicago, July 27.—Decidedly firmer conditions prevail in the scrap iron and steel market in Chicago, heavy operation of steel mills having required considerably more tonnage than for some time. A leading maker is said to have bought 20,000 tons in one lot recently of heavy melting steel and this product now is quoted at $10.75 to $11.25, which is considerably above former levels. In keeping with steel grades, other items on the scrap list are considerably advanced.

The Chicago, Rock Island & Pacific railway is offering a list containing 2,600 tons and the Burlington is offering about 2,200 tons.

Moderate Buying of Ore

Cleveland, July 27.—The buying of iron ore continues at a moderate rate and the outlook is that there will be a lively finish of the season on the Great Lakes. No further reports of cutting on prices have been heard.

The plant of the Bonney Vise & Tool Co., Allentown, Pa., has been enlarged by the erection of a forging department, 53 x 150 feet.

(For complete prices see page 242.)

Billets Scarce

Prices Higher and Further Advances Are Expected

Pittsburgh, July 27. — Semi-finished steel continues to show extreme strength and further advances have been made the last week. Makers report an absolute scarcity of open hearth material and say none can be purchased from the mills in this district. Open hearth billets, makers claim, cannot be delivered to this market for less than $24. Bessemer billets are held firmly at $22, Pittsburgh, and increasing demand is expected by some to result in higher prices soon. Rolling mills, working on open hearth material, are deferred seven and eight weeks and, in some cases, three months. Bessemer sheet bars continue strong at $22, Pittsburgh, and open hearth sheet bars at $23, Youngstown mills, prominent dealers claiming the quotation on this material at Pittsburgh should not be less than $24. Wire rods continue to command $26 for domestic delivery, with most of the makers out of the market. Muck bar is quoted at $27, Pittsburgh.

Premiums Paid

Philadelphia, July 26.—The volume of inquiry for billets continues heavy in this territory, due to the fact that most of the steel mills are having difficulty in turning out enough billets to meet their requirements. While no large tonnages are reported, sales of small tonnages have been made and in a good many cases premiums have been paid for early delivery. Thus, as high as $35, Philadelphia, has been done on ordinary forging steel, and as high as $28, Philadelphia, on open hearth rolling billets.

Full Ingot Capacity

Buffalo, July 27.—The Lackawanna Steel Co., Buffalo, it is stated, is now operating to the full ingot capacity of its plant, having its 14 open hearth and two Talbot tilting furnaces in commission. Four additional open hearth furnaces are in the course of construction, and with these in use the plant could work more of its mills.

Canadian interests have been in the Buffalo market recently with an inquiry for about 3,000 tons of billets, but were unable to place the order here. The New York State Steel Co.'s plant, in the hands of receivers, and out of commission, would find a ready market for its billet production now if it could be placed in operation.

Shape Mills

Are Very Busy, But Fabricators Are Making Low Figures

New York, July 27.—New structural business in this territory continues to come out slowly and lettings for the week are not large in the aggregate. In fact, structural contractors here are free to state that were it not for the large amount of work under contract for subway extensions, they would have little to keep their shops busy. Hopes are held, however, for greater activity in the future. Despite the scarcity of structural lettings, the shape mills, as previously reported, are exceedingly busy and are having great difficulty in making deliveries on contracts. Specifications still are coming in in big volume and the mills constantly are falling farther behind. As a result, on small lots for immediate delivery, consumers in a number of cases have been forced to pay 1.35c, Pittsburgh. Although the 1.25c, Pittsburgh, price continues to be heard of occasionally, the bulk of the business now is going at 1.30c.

Many Small Orders

Philadelphia, July 26.—Although no large tonnages were placed in the shape market here last week, a good volume of business, made up of small lots, was entered. As in plates and bars, deliveries seem to be getting farther away in shapes and the tone of the market, as a result, is exceedingly satisfactory. No further action has been taken on the heavy tonnages for extensions to munition plants. Bids have gone in on 1,000 tons for a bridge to be erected at Milton, Pa., by the Philadelphia & Reading railroad. The Pennsylvania railroad is taking bids on several lots of steel, for bridge and building work, totaling about 1,000 tons. The 1.25c, Pittsburgh, quotation is not heard so often and most of the mills will consider nothing less than 1.30c, Pittsburgh. Bids are about to go in on some 900 tons for the new Franklin Bank building.

Stronger in Pittsburgh

Pittsburgh, July 27.—The mill situation in structurals has improved the past week. Some plants, which are not operating at capacity, have taken tonnages at less than 1.30c, the prevailing level. This factor, however, has not been important enough to disturb the market. Some of the bar mills are so well filled up that they are unable to promise immediate shipment. The Jones & Laughlin Steel Co., with a bid of $113,965, has been awarded the contract for fabricated steel for the new city-county building, to be erected jointly by the city of Pittsburgh and Allegheny county, at Pittsburgh. The contract involves approximately 5,400 tons of steel. The American Bridge Co. has been awarded 400 tons of steel for a new building of the Willys-Overland Automobile Co. at Toledo, O.

Ore Unloaders

Cleveland, July 27.—The only contract of any size reported in this district is for 900 tons for ore unloaders for the Pittsburgh & Conneaut Dock Co., Conneaut, O., a Steel Corporation subsidiary, taken by the Wellman-Seaver-Morgan Co. The steel will be furnished by the Carnegie Steel Co. Competition among fabricators continues to be very keen and some low prices are still named by fabricators who contracted for plain material before recent advances took place.

Shapes are Strong

Chicago, July 27.—Structural shapes are strong at 1.49c, Chicago mill, and a considerable tonnage is coming out from week to week all over the west. The largest item contracted in the past week is a warehouse at St. Paul, Minn., for the Overland Stores Co., which involves 2,950 tons and was awarded to the Minneapolis Steel & Machinery Co. Other items are for smaller quantities and well scattered through the middle west.

Hippodrome Contract

Milwaukee, July 27.—Contracts involving 526 tons of shapes and 105 tons of reinforcing bars were awarded July 24 by Kirchoff & Rose, architects, Milwaukee, in connection with lettings on the new Palace hippodrome building, Milwaukee. The structural contract was awarded to Milwaukee Bridge Co., Milwaukee. The C. Colnik Co. was awarded the ornamental iron work and Biersach & Niedermayer the sheet metal contract.

CONTRACTS AWARDED.

Overland Stores Co., warehouse, St. Paul, 2,950 tons, to Minneapolis Steel & Machinery Co.

Methodist Book Concern, building, Chicago, 852 tons, reinforced concrete.

United States Government and State of California, Colorado river bridge, near Topock, Ariz., 788 tons, to Kansas City Structural Steel Co.

Palace Hippodrome building, Milwaukee, 526 tons, to Milwaukee Bridge Co.

Marathon county, Wis., Wisconsin river bridge at Mosinee, Wis., 259 tons.

High School building, Dallas, Tex., 235 tons.

Gymnasium building for Creighton University, Omaha, Neb., 200 tons.

Extensions plant of New Jersey Zinc Co., Hazard, Pa., 850 tons, to American Bridge Co. and 650 tons to the Phoenix Bridge Co.

Rice office building, Boston, 800 tons, to the American Bridge Co.

Plant for Empire Floor and Wall Tile Co., Metuchen, N. J., 650 tons to the Heddon Iron Works.

Mohawk hotel, Schenectady, N. Y., 150 tons to Eastern Bridge & Structural Co.

Loft building, Market and Halsey streets, Newark, N. J., 300 tons, to S. L. Davis, Newark.

Murray Hill building, New York, 900 tons, to Hedden Iron Works.

Fertilizer plant at Baltimore, 500 tons, to Pittsburgh Bridge & Construction Co.

Pennsylvania railroad stockyards at Herr's island, Pittsburgh, 300 tons, to American Bridge Co.

National Savings & Trust Co., building addition, Washington, 300 tons, to Dietrich Bros.

CONTRACTS PENDING.

Additional third tracking of electric railroad in Myrtle avenue, Brooklyn, for New York Municipal Railways, 4,200 tons, bids being taken.

Additional bridge for Philadelphia & Reading railroad at Milton, Pa., increasing total to 1,500 to 1,600 tons.

(For complete prices see page 242.)

New Carnegie Shape Book

The fifth edition of the Carnegie Shape Book, published by the Carnegie Steel Co., Pittsburgh, has been issued. With a few unimportant exceptions, it contains profiles of all of the sections rolled on the structural, plate, bar and rail mills of the Carnegie Steel Co., together with tables of data in regard to these products. It is stated that the dimensions on the profiles are theoretical and that whenever the profile applies to more than one weight of section, the dimensions are for the minimum weight.

Four years have elapsed since the fourth edition of this publication was issued and a comparison of the new volume with its predecessor will show roughly the progress which has been made in the introduction of steel into new fields since 1911. Among the relatively new lines of manufacture will be noted very many new sash and casement sections used in the construction of metal window frames, sky lights, etc., together with a large number of automobile sections and a line of light weight beam sections, which are distinguished from the American standard sections by the designation structural beams.

Tables of dimensions and weights are included with the section profiles and comprehensive tables covering the weights of rectangular and circular plates, flat rolled steel, round and square bars, etc. are included. Complete details of the numerous rail sections manufactured by the Carnegie company are also given. The book is printed on special light weight thin paper and is attractively bound in green leather with gilt edges. Copies may be procured at a price of $1.00.

The Otis Elevator Co. has closed a contract with the H. & S. Pogue department stores of Cincinnati for 10 steel elevators to cost $5,000 each.

Ferro Shipments

Are Still Enveloped in Doubt—Little Business Closed

New York, July 27.—About the only new development in the ferro-manganese situation is that one of the English producers has advised its agent here that it has been granted a license for shipping some of the alloy to this country in August. Nothing is said as to the tonnage to be sent forward. This maker of late has been one month behind in its shipments, and it is not known whether the license granted in this case covers metal booked for July shipment or August shipment. This development, therefore, does not definitely indicate whether or not shipments of ferro-manganese will continue to come forward from England to this country in a general way after Aug. 1. That shipments will not be cut off entirely, however, is reflected in the fact that one agent of an English concern is willing to book a limited amount of business for delivery over the rest of the year.

Very little future business has been closed of late and the demand as a rule has involved spot and nearby shipment. Importers have very little material to dispose of for spot shipment and most of the business of this character appears to involve the domestic product. The price continues unchanged, but in some quarters of the trade an advance is looked for.

Unchanged at Pittsburgh

Pittsburgh, July 27.—The market for ferro alloys remains unchanged from last week. Ferro manganese continues to be held at $100, seaboard, and above, while 50 per cent ferro silicon still commands $73, Pittsburgh, for small quantities. Tungsten, quoted at $2.50 a pound of contained alloy, shows good activity and makers of tool steel report difficulty in obtaining this material. A spread from eight to 12½ cents is quoted on ferro-carbon-titanium, while ferro-vanadium is quoted at $2.30 a pound by some sellers, but the principal sales of this alloy have been at $2.25 a pound.

Wire Mills Are Busy

Pittsburgh, July 27.—Wire mills in the Greater Pittsburgh district continue to operate at capacity on orders placed earlier in the year. Plain wire is quoted at 1.40c and galvanized is irregular at 2.20c. Heavy shipments for both galvanized, barbed and smooth wire are being made to European belligerents, with the former at 90c extra and the latter at 80c extra. Two hundred tons of smooth wire have just been taken by a leading independent producer in the eastern Ohio district. Nails are held at $1.60 a keg, but mills are still shipping on contracts at $1.55.

Strong at Buffalo

Buffalo, July 27.—The same satisfactory strength shown in the past few weeks continues in the wire market. The mills report they are taxed to their capacity and that as soon as the general trade realizes this situation there will be a stampede to get in their orders and cover for requirements. Prices are held firmly and deliveries are becoming more extended.

Nuts and Bolts

Prices Are Advanced by Some Manufacturers

Cleveland, July 27.—Owing to the recent very decided improvement in nuts and bolts, a number of manufacturers of bolts have reduced discounts 5 per cent. Nuts have also been advanced from $3 to $5 per ton by some concerns. Other manufacturers of nuts and bolts, however, are adhering to the recent quotations. The usual quotation on structural rivets is still 1.50c, Pittsburgh, and on boiler rivets 1.60c for third quarter, with $1 advance for fourth quarter, and these prices are pretty firmly adhered to, although slight concessions have been made on very desirable business.

Stiffening Noted

Buffalo, July 27.—Prices have assumed a stiffening tendency in bolts and nuts, owing to the marked increase in the demand. Some of the manufacturers have already raised their schedules 5 per cent for the larger carriage, coach and machine screws.

The Buffalo Bolt Co., of Tonawanda, is to erect a large addition to its plant, putting in a mill for the purpose of drawing its own wire and rods. Instead of entering the market for billets, it is also said the company contemplates the installation of Talbot tilting furnaces.

Among orders recently taken by Thomas W. Carlin's Sons Co., Pittsburgh, are a 20 x 12-inch crusher for the Pittsburgh Steel Co., Pittsburgh; two 9 x 10-inch three-drum hoisting engines, together with feed pumps, for the United States Engineers' office, Pittsburgh, and several large shears, crushers and wet pans for delivery to points in New York, eastern Pennsylvania, Texas and Ohio.

(*For complete prices see page* 242.)

Warehouses

Report Continued Improvement in Business

Cleveland, July 27.—Warehouse business continues to improve and it is expected that this month will show a larger tonnage sold than during June, thus keeping up the steady improvement which has continued for a number of months.

Cheaper Sheets from Store

Chicago, July 27.—The only change in prices of steel products from store is a slight decline in galvanized sheets. One dealer now quotes 4.70c base for No. 22 gage and lighter, and 4.50c, base, for 20 gage. Other steel products remain unchanged with business somewhat brisker since the settlement of the building trades strike.

B. & O. Distribution

Chicago, July 27.—The Baltimore & Ohio Railway Co. has distributed 2,000 steel hopper cars, giving 1,000 to the American Car & Foundry Co., 500 to the Cambria Steel Co. and 500 to the Pressed Steel Car Co.

Urging Deliveries

Philadelphia, July 27.—Several small rail tonnages have been let by eastern roads during the week, but business of size has been totally lacking. Practically the only change in the situation, railmakers say, is that several of the railroads urgently are calling for deliveries on rail contracts previously entered.

Will Move to Troy, Pa. — The Thomas Coupling Co., Warren, Pa., shortly after Sept. 1, will move its offices and business to Troy, Pa., where it is now erecting a new plant which, when completed, will be one of the most modern of its kind in the country. The equipment will consist of absolutely new tools throughout. Heretofore the company has been specializing on shaft couplings, but in the new plant will take on the manufacture of the entire power transmission line.

The current issue of *Reactions*, a 24-page quarterly issued by the Goldschmidt Thermit Co., New York, contains several interesting illustrated articles describing the use of its product on difficult welding jobs.

A large order for heavy motor trucks has been received from Europe by the Gramm-Bernstein Motor Co., Lima, O. The trucks, it is understood, will be used by the Russian government.

Sharp Decline

In Prices of Non-Ferrous Metals, Especially Spelter

New York, July 27. — The week again has witnessed a sharp decline in the prices of most of the metals, due to lack of demand and low offers which second sellers have made to attract buyers. The sagging tendency especially has been reflected in spelter, which, for prime western, now approximately is 18c to 18.50c for July, 17.50c to 18c for August, 17c to 17.50c for September, and 16.50c to 17c over the last quarter. Brass special is quoted nominally at 21c to 22c for July, 20.50c to 21c for August and September, and 20c to 20.50c for the last quarter. Sheet zinc has been reduced to 24c, f. o. b. Illinois mills, less the usual discount of 8 per cent on carload lots. There was some buying of spelter last week, but it was not of a sustained character.

Copper also has weakened in surprising fashion, considering the amount of business which producers have on their books. Taking into account the low offers of second sellers, electrolytic is quoted at 18.75c to 19.25c, delivered 30 days, best grades of casting copper at 18.50c to 19c, delivered 30 days, and ordinary casting copper at 17.12½c to 17.37½c, cash. The market on prime lake and arsenical lake copper nominally is 18.75c to 19.25c, cash, the lower prices being those quoted by second sellers. Best brands of lake continue to be quoted nominally at 21c to 22c, cash.

Although lead producers continue to adhere firmly to their asking prices, 5.75c, New York, and 5.62½c to 5.67½c, St. Louis, the market is lower by reason of the low second hand offers. These interests show a more marked disposition to make concessions and are quoting generally 5.50c, New York, and 5.40c, St. Louis.

The tin market has registered slight declines, probably in sympathy with the declines in the other metals. Spot tin now is held at 36c, and this figure also is asked for July and August delivery. September is held at 35.75c, and October, November and December at 35.50c. There is some inquiry for futures and a few sales of spot are reported occasionally, but speaking in general terms, the market is stagnant.

Spot Chinese antimony has sold today at 35c, and it is unnecessary to pay higher than 35.25c, duty paid. This figure is 1c to 2c lower than was done a week ago. Offers on futures lately have been made at prices figuring out to about 37c, duty paid.

The aluminum market is firm. Second sellers during the week sold carloads of No. 1 ingot at as high as 35c and 37c, but these were special prices and the market is quoted at 31c to 33c.

Machinery

Formed an Important Part of the Exports in May

Supplementing the information published in *The Iron Trade Review* of July 22, in regard to foreign commerce in iron and steel products, some additional facts are now available.

The imports reported on a tonnage basis for May are almost exactly the same as those for the same month in 1914, the figures being 28,917 for May of this year and 28,174 for May, 1914. In April, 1915, the imports were only 16,564 tons, the principal increase in May being due to the importing of 13,434 tons of rails, compared with 8,921 tons in April, 1915, and 2,189 tons in May, 1914. The imports of some materials are almost negligible, for example only 19 tons of structural material in May 1915, compared with 573 tons in May, 1914; 82 tons of sheets and plates, compared with 465 tons in May, 1914, and 24 tons of tin and terne plate, compared with 2,668 tons in May, 1914.

IRON AND STEEL IMPORTS, GROSS TONS.

	May,		Eleven months ending May,	
	1915.	1914.	1915.	1914.
Scrap	2,221	997	29,834	29,656
Pig iron	11,409	17,182	100,082	126,804
Ingots, blooms, billets of steel	1,008	2,584	23,826	34,043
Wire rods	487	662	4,340	10,864
Rails	13,434	2,189	38,046	14,709
Bar iron	233	854	9,620	20,204
Structural	19	573	5,525	9,924
Sheets and plates	82	465	2,463	2,855
Tin and terne plate	24	2,668	4,676	21,641
Total	28,917	28,174	218,412	270,700

The exports of commercial automobiles last May amounted to 2,426, valued at $6,583,912, compared with only 99, valued at $127,024, in May, 1914. The exporting of passenger vehicles, also shows a gain, the figures being 4,821, valued at $3,971,483, for May, 1915, and 3,157, valued at $2,857,601, for May, 1914. Exports of agricultural implements and parts show a slight gain in May, of this year, as compared with April, the value in May being $1,711,379 and in April $1,534,715, but the value is still below that of May, 1914, when the exports amounted to $2,207,545.

Exports of aeroplanes show a slump as compared with April, the figures being 46, valued at $318,492, in April, and only 10, valued at $83,950, in May, but in May, 1914, only one aeroplane was exported, and it was valued at $4,000.

The value of exports of metal working machinery, including machine tools, continues to increase, the amount being $1,235,590 in May, 1914, $3,300,953 in April, 1915, and $3,762,567 in May, 1915. The total value of machinery exports in May was $10,214,062, compared with $9,780,752 in May, 1914. The total value of iron and steel manufactures exported in May was $26,536,612, compared with $19,734,045 in May, 1914.

In May, 1914, the value of zinc and manufactures of, except ore and dross, was only $41,965, while in March, of this year, it was $1,251,132, in April $1,885,464, and in May $2,481,924.

Equipment

Of Defunct Wisconsin Engine Co. Has Been Sold

Milwaukee, Wis., July 27.—The machinery, equipment, stock and all personal property of the defunct Wisconsin Engine Co., Corliss, Racine county, Wis., has been disposed of to the E. L. Essley Machinery Co., Chicago and Milwaukee, by the First Trust Co. of Milwaukee, reciever. The sale price is not given, but it is said to run well into the hundreds of thousands. The deal does not involve the buildings or real estate.

The Essley company intends to dismantle the plant at once and use the equipment, always considered of the highest type and quality, to fill the extraordinary demand for all kinds of machine tools, lathes, engines, etc., in the American metal trades at this time. The Wisconsin plant consists of four large brick structures, a foundry, a machine shop, a pattern shop and a warehouse, all erected less than 15 years ago. The product was corliss engines, heavy gas engines and pumping engines.

As the result of the sale of the equipment, creditors of the bankrupt Corliss concern have been called to meet at 10 o'clock a. m., Aug. 4, to consider the declaration of a third dividend and for the allowance of the final report of the reciever and his claim for $2,000 compensation.

Nothing can be learned as to the probable disposition of the buildings and real estate, which comprises hundreds of acres.

Industries at Greenville, Pa., are enjoying considerable activity, according to reports from that city. The plant of the Chicago Bridge & Iron Co. is working double turn, seven days a week, and the plants of the Greenville Steel Car Co., the Hodge Mfg. Co., DuPont Powder Co. are running at maximum capacity.

(For complete prices see page 242.)

Steady Increase

In Steel Corporation Earnings Since Last January

The report of earnings of the United States Steel Corporation for the second quarter of this year shows a very handsome increase over the first quarter and indicates that the steady advance in earnings which started in January, 1915, has been continued until the earnings for June amounted to $11,343,070. The earnings of the Corporation by months, from September, 1914, are as follows:

September, 1914	$5,580,533
November, 1914	2,798,388
December, 1914	2,554,249
January, 1915	1,687,150
February, 1915	3,638,578
March, 1915	7,132,081
April, 1915	7,286,409
May, 1915	9,320,576
June, 1915	11,343,070

The report for the second quarter is as follows:

EARNINGS.

	Earnings before chg. int. on the Sub. Co.'s bonds outstand'g.	Less: Int. on the Subsid. Co.'s bonds outstand'g.	Balance of earnings.
Apr., 1915	$8,149,935	$863,526	$7,286,409
May, 1915	10,184,021	863,445	9,320,576
June, 1915	12,202,511	859,441	11,343,070
	$30,536,467	$2,586,412	
Total earn. after deduct. all exp. incident to oper., includ. those for ord. repairs and mainten. of plants and int. on bonds of the subsid. comp.			$27,950,055
Less, chgs. and allow. for deprec., applied as follows, viz.:			
To sinking funds on bonds of sub. Cos. and depr. and extr. replace. funds		$6,031,013	
To sink. funds on U. S. Steel Corp. bonds		1,607,458	
			7,638,471
Net income			$20,311,584
Deduct: Int. for quar. on U. S. Steel Corp. bonds outstanding		$5,493,884	
Prem. pay. on bonds redeem. und. sink. funds		245,136	
			5,739,020
Balance			$14,572,564
Div. for the quar. on stk. of the U. S. Steel Corp., viz.: Prfd., 1¾ per cent			6,304,919
Surp. for the quarter			$8,267,645
Deficit for quar. end'g Mar. 31, 1915			5,389,861
Bal. of surp. for six months end. June 30, 1915			$2,877,784
Unfilled orders on hand: June 30, 1915			4,678,196 tons

Gartland Bros., Marion, Ind., are about to build a gray iron foundry in Toledo, owing to the efforts of the Toledo Commercial club. A site is now being looked for and a building to cost about $50,000 will be erected.

Will Make Fertilizer.—The new plant of the Tennessee Coal, Iron & Railroad Co., at Birmingham, to manufacture out of open hearth slag a land fertilizer known as duplex basic phosphate by crushing and pulverizing the slag, has begun operations. It is the only plant of its kind in the south and is the object of much interest. The storage capacity of the plant is 7,000 tons and the plant will be operated, it is announced, so as to fill these bins by the time the fertilizer season opens.

Manganese Ore

Mined Last Year a Small Part of Tonnage Used

The production of manganese ores in the United States in 1914 amounted to 2,635 long tons, which was 1,413 tons less than the output of 1913, according to D. F. Hewett, of the United States geological survey. The manganese ore shipped in 1914 was derived from mines in Virginia, South Carolina and California. The domestic output was small when compared with the imports of manganese ores, which amounted in 1913 to 345,090 long tons and in 1914 to 283,294 long tons.

India, Russia and Brazil have been the principal countries from which manganese ore has been imported. In 1913 the largest imports were from India, amounting to 141,587 tons, and the imports from Russia were 124,337 tons. The closing of the Dardanelles and probably the scarcity of vessels for transportation from India in 1914 had the effect of reducing the imports from Russia to 52,681 tons and those from India to 103,583 tons. These decreases were partly compensated for by the increased shipments from Brazil, which were 70,200 tons in 1913 and 113,924 tons in 1914.

The output of all grades of manganiferous ores in 1914 was 445,827 long tons (mainly from the Lake Superior region), of which 60,414 tons contained more than 15 per cent of manganese and was used in the manufacture of low-grade ferromanganese and manganiferous pig iron.

The marketed domestic production of ferromanganese in 1914 was 100,731 long tons, or 18,764 tons less than in 1913, and the imports of ferromanganese were 82,997 long tons, as against 128,070 tons in 1913. The marketed domestic production of spiegeleisen decreased from 106,980 long tons in 1913 to 76,625 tons in 1914, and the imports increased from 77 tons in 1913 to 2,870 tons in 1914.

As heretofore, practically all the domestic output of ferromanganese was made from imported ores, though some medium grade ferromanganese was made from manganiferous iron ores of the Cuyuna range in Minnesota.

Rather Slow

Is Delivery of Shells on Orders Placed in Canada

Toronto, July 27.—The manufacturers engaged in the making of shells are anxiously awaiting the arrival in Ottawa of David A. Thomas, purchasing agent for the British government, so that they can ascertain what further orders are likely to be given out, and get the industry placed on an assured basis. A number of them have been in conference with the shell committee at Ottawa, and it is understood that further large orders will be given out as soon as it can be shown that fixed ammunition can be turned out at a rate to keep pace with the manufacture of empty shells. In the present unorganized state of the industry, this cannot be done. Gen. Bortram, chairman of the shell committee, who is at present making a tour of the factories in Ontario to hurry on the work, states that though orders to the value of $152,000,000 have been placed, the shipments so far only amount to about $10,000,000. The lack of facilities for assembling the shells continues to be a drawback, and in the absence of any assurance as to future orders, the proposal to co-operate in establishing a plant for that purpose has not yet taken practical shape.

Steadily Increasing Activity

Chicago, July 27.—One additional blast furnace stack was blown in July 23 at South Works of the Illinois Steel Co. at South Chicago and another stack will be put in blast this week at that plant. This makes a total of nine stacks active out of 11 at this plant. Other departments of South Works are operating practically at full speed with the exception of the bessemer department, which is not under so severe pressure.

The plant of the Indiana Steel Co. at Gary, Ind. is operating full with all its blast furnaces active and as many open hearths as can be kept in condition for operation.

The Consolidated Power & Tool Co., Hastings, Mich., is inquiring for material to erect an addition of steel construction 150 x 300 feet, which practically will double its capacity. Just what use will be made of this structure is not announced further than it will be a machine shop.

The contract for the construction of a new steel bridge over Wisconsin river at Mosinee has been awarded to the Wausau Iron Works, Wausau, Wis., at $22,400, or more than $3,500 lower than the estimates.

New Rates

On Finished Steel Products From Chicago to Coast

New transcontinental freight rates on finished steel products from Chicago to points on the Pacific coast and inland towns near the coast have been put into effect. These rates are the result of arduous work on the part of the transcontinental freight committee and shippers interested in this class of traffic.

A feature which has not been applied generally in any previous rate-making is a prominent item in the new rates. This is a differential rate, varying with the tonnage placed on a car. For instance, steel bars from Chicago to Seattle take a rate of 80 cents on a minimum carload of 40,000 pounds. The same product with a minimum carload of 50,000 pounds is carried at 65 cents per 100 pounds; while a minimum carload of 60,000 pounds is granted a rate of 55 cents per 100 pounds.

The purpose of this distinction is to stimulate full loading of cars and at the same time to allow the small shipper, who might not be able to handle the larger minimum, an opportunity to ship a smaller car by paying a larger rate, thus giving the railroads approximately the same return.

In the case of inland towns which do not receive the full benefit of the Pacific coast rate, the rates are based upon the charge to the coast plus 75 per cent of the local rate from the coast to destination. This makes the price on steel bars 15 cents to 25 cents higher per 100 pounds to Spokane than to Seattle. In the rates to Spokane the minimum weights are 40,000 and 50,000 pounds, no provision being made for 60,000-pound cars.

In the case of steel bars, beams, angles and plates, No. 11 gage and heavier, the rates and minimums apply only on articles 40 feet long and under. Longer pieces than this require loading on two cars, resting upon bolsters. A request is now before the interstate commerce commission to remove this restriction and allow the same rates on longer pieces, provided the loading on two cars be twice the minimum provided on one.

The following tables of rates to Seattle, which is an ocean terminal, and to Spokane, which is an inland destination, will explain the situation clearly; and the same ratio applies to all other points:

RATES ON STEEL PRODUCTS.

Chicago to Seattle.

Product.	Rate per 100 lbs.	Minimum carload, lbs.
Steel billets	$0.55	80,000
Steel bars	.80	40,000
	.65	50,000
	.55	60,000
Steel beams	.80	40,000
	.65	50,000
	.55	60,000
Steel angles	.80	40,000
	.65	50,000
	.55	60,000
Steel rails, gross ton	11.00	60,000
Steel plate, No. 11 and heav.	.80	40,000
	.65	50,000
	.55	60,000
Over 40 feet long	.55	80,000
Steel sheets Nos. 12 to 16	.55	80,000
No. 16 and lighter	.65	50,000
Steel wire	.55	80,000

Chicago to Spokane, Wash.

Steel billets	$0.72	.....
Steel bars	.95	40,000
	.90	50,000
Steel beams	.95	40,000
	.90	50,000
Steel channels	.95	40,000
	.90	50,000
Steel angles	.95	40,000
	.90	50,000
Steel rails, gross ton	15.01	60,000
Steel plates, No. 11 and heav.	.95	40,000
	.90	50,000
Steel sh., No. 12 and light	.80	50,000
Steel wire	.85	40,000

Slag Tariff

Is Effective in West Virginia as Well as in Ohio and Pennsylvania

Pittsburgh, July 27.—The action of the public service commission of West Virginia in revoking its recent order suspending tariffs proposing a charge of 20 cents per ton for hauling slag from blast furnaces and steel mills did not create any particular surprise here. Contention was made by railroad representatives at the arguments before the commission at Charleston yesterday that it exceeded its authority in suspending the tariffs after they had become operative. The commission accepted the point as being well taken and decided the petition for suspension had been filed too late. The West Virginia slag tariff, therefore, has become effective and this places the matter on a par with the situation existing in Ohio and western Pennsylvania and accords with the interstate tariffs, which become effective tomorrow. Unless the charge is voluntarily reduced by the railroads, steel interests have announced they will protest against the tariffs before the three state commissions and the interstate commerce commission.

The open hearth steel plant of the Youngstown Iron & Steel Co., Youngstown, will begin operating within the next 30 days. The works consists of four furnaces, blooming mill, sheet bar and billet mills. Hot metal will be furnished by Mary furnace of the Ohio Iron & Steel Co.

Branch Plant

Will Be Established in Canada By Motor Company

Toronto, July 27.—W. C. Durant and A. B. C. Hardy, of the Chevrolet Motor Co., of New York and Flint, Mich., are in Toronto, organizing a Canadian branch company, and arranging for the establishment of a plant here. The name of the company will be the Chevrolet Motor Co., of Canada, Ltd., and it will have a capital of $500,000. Thomas Houghton, superintendent of the Dominion Carriage works, will be manager. It is hoped that a factory building can be obtained, which will be suitable for immediate working and that active operations can be begun by Sept. 1. About 500 men will be employed, and the output is expected to be 15,000 cars per annum.

It is announced that the plant of the International Harvester Co., at Hamilton, Ont., which has been closed down for some time, will be re-opened in about two weeks, as a large number of orders have been received. These are for the ordinary lines of the company's output and not for war munitions.

The Dominion Steel Corporation has now four blast furnaces in operation, No. 7 furnace being blown in July 5. Production for the month of June shows an increase, the figures in tons being as follows: Pig iron, 22,552; steel ingots, 28,680; rails, 13,044; rods, 6,435; bars, 797; wire and wire products, 3,167.

The Canadian Car & Foundry Co., Montreal, has received an order from the British war office for 1,200 four-wheel, continental type, 22-ton steel frame box cars, amounting to a value of about $1,200,000.

Buys Cherrytown Plant

William Burnside, Bellefonte, Pa., has purchased the plant of the Cherrytown Iron Works, Cherrytown, Pa., for $12,000. The Cambria Title Savings & Trust Co., at Evansburg, took over the plant about a year ago as trustee for the bondholders, but it has been kept in operation throughout the year. Mr. Burnside states that he will make a number of improvements. The Cherrytown Iron Works has specialized in the building of mine cars, in addition to doing a general foundry business.

The Hammond Iron Works, Warren, Pa., has shipped nine steel oil tanks, each having a capacity of 55,000 barrels, to Mexico. About 3,000 tons of steel are involved in the order.

Death of D. B. McClelland

Dilworth B. McClelland, one of the best known members of the pipe trade in this country, died unexpectedly July 21 at his home in Pittsburgh. Heart failure was the cause of his demise. He was vice president, treasurer and a director of Spang, Chalfant & Co., Inc.

Mr. McClelland was born in Pittsburgh 56 years ago and began his business career with the T. C. Jenkins Co. Later he became manager of the Pittsburgh office of the American Tube & Iron Co., and subsequently took charge of the New York office of that concern. Upon the formation of the National Tube Co. he became identified with its foreign department with offices at Pittsburgh, where he remained for about five years. He left the National company to take charge of the pipe department of Crane Co., Chicago. About 11 years ago he accepted a position with Spang, Chalfant & Co., Inc. Aside from being an officer of that concern, he was treasurer and a director of the Fayette Coal Co. and the Spang Land Co., subsidiary interests. Mr. McClelland was a member of the Duquesne and Union clubs, Pittsburgh, and the Hardware club, of New York, and belonged to several social organizations.

Death of J. L. Mott

Jordan Lawrence Mott, president and trustee of the J. L. Mott Iron Works, Trenton, N. J., died on July 26 at the old Mott homestead, 2122 Fifth avenue, New York. Mr. Mott was in his eighty-sixth year and death was due to the infirmities of old age. He was a member of a distinguished family, being descended from Adam Mott, who came to this country from Essex, England, and settled in New Amsterdam prior to 1647. Mr. Mott's ancestors took a prominent part in the affairs and development of the city of New York. He was the son of Jordan L. Mott, who founded the iron works which grew into the present company. The younger Mott was admitted into the business in 1853, after having served an apprenticeship of three years. In 1866, he assumed entire charge of its affairs and continued to hold the reins until his death, although he became less active about 10 years ago. The plant up to that time had been located at Mott Haven, on the Harlem river, New York; in 1905 it was moved to Trenton. Mr. Mott at one time was president of the North American Iron Works and was prominently identified with other interests. For many years he was an active Democrat and in 1876 and 1888 was a presidential elector. Like his ancestors, he took a prominent part in the municipal affairs of New York. Mr. Mott was an enthusiastic yachtsman and owned one of the fastest vessels on the list of the New York Yacht Club. At the outbreak of the Spanish-American war, in 1898, he offered his yacht Puzzle to the government, and as a result, the Puzzle was employed as a dispatch boat and privateer throughout the war.

Obituaries

Robert Parrish, president of the Oriskany Ore & Iron Corporation, died at his home in Covington, Va., on July 23.

George H. Lloyd, iron manufacturer, and said to be the oldest graduate

D. B. McCLELLAND

of Holy Cross college, died on July 24 at his home in Roxbury, Mass., aged 84 years.

George Nicholson, treasurer of the Nicholson File Co., Providence, R. I., died at his home in that city, July 16, from Bright's disease, aged 72 years. He had been treasurer of the company for the last 54 years.

Henry Born, treasurer and manager of the Born Steel Range Co., Cleveland, died July 21 in that city after an illness of three months, aged 70 years. He was born in Germany and came to this country when young. Twenty years ago he founded the range company and had been active in its management.

William H. Wallace, a retired iron manufacturer, died at Brooklyn July 20, aged 84 years. Mr. Wallace early in his business career practiced mechanical engineering and became connected with the Allaire Iron Works, of New York. Later he established himself as an iron and steel merchant and became the head of the firm of William H. Wallace & Co.

George Henry Lloyd, commonly known as the dean of iron men in New England, died July 23 at his home in Roxbury, Mass., of capillary bronchitis, aged 82 years. For many years he was prominent in the steel and iron business, with offices in State street, Boston. Among the large activities he had engaged in was the rehabilitation of the Iowa Central railroad. It was considered to be largely due to Mr. Lloyd's business acumen that the stock of the road rose from 7 to 135 in the space of two years by reason of sound financial management.

The death of Sir Sandford Fleming, the dean of the engineering profession in Canada and a prominent man in public life, took place at Halifax, July 22, at the age of 88. He was born in Scotland and came to Canada in 1845, where he joined the staff of the Northern railway, of which he became chief engineer. In 1863, he visited England to promote the scheme of uniting the then isolated provinces by railway communication, and on his return surveyed the route of the Intercolonial railway, which was built under his control. From 1867 to 1880, he was chief engineer of the Canadian government, his greatest work being the survey for the Canadian Pacific, which he successfully carried out in the face of apparently insuperable obstacles. In 1880, he retired from active professional work and in 1897 was knighted in recognition of his public services.

Busy Town

Defiance, O., July 27.—This city is enjoying the greatest manufacturing prosperity in its history. The Defiance Machine Works, one of the oldest and most reliable shops in the city, is running night shifts in order to keep up with the demand for its product, and the Defiance Screw Machine Products Co. is also running night and day in an effort to keep up with orders. The night shift works 11 hours. The American Steel Package Co. is also very busy and is building an addition to its plant. The Superior Oxygen Co., a new plant, manufacturing a welding gas, is in full operation. The greatest difficulty is the housing of the families of men working in these factories and 50 or 100 new dwellings are badly needed.

The Wilson Window Guard Co., of Indianapolis, has changed its name to the Diamond Wire & Iron Works.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

P. R. Foley, who has been identified with the Eastern Steel Co., Pottsville, Pa., since the date of its organization in 1902, first as treasurer and later, from 1905 until the present, as Philadelphia sales agent, has been appointed general manager of sales. He succeeds Lorenzo C. Dilks, who resigned this office on July 1, to become president of Milliken Bros., Inc., New York. Incidental to the change, the general sales headquarters of the company are transferred from New York to Philadelphia, to Mr. Foley's old offices in the Pennsylvania building. Mr. Foley, who was born in Philadelphia in 1861, has been identified with the iron and steel business since boyhood. For 22 years he was connected with Cofrode & Saylor, rising from a minor position to the office of treasurer. This company operated a bridge shop in Pottstown, Pa., and rolling mills in Reading. Later, until he took part in the formation of the Eastern Steel Co. he was in the contracting business, as a partner in Leonard, Foley & Co., Philadelphia.

W. K. Kenly, of the Merchants Steel & Supply Co., Chicago, president of the National Scrap Iron and Steel Association, is spending a few weeks in California.

Robert Backus, chief stationary engineer, at the Ohio works of the Carnegie Steel Co., at Youngstown, is attending the Panama-Pacific Exposition, at San Francisco.

G. F. Alderdice, assistant general manager of sales of the Republic Iron & Steel Co., Youngstown, has resigned to become assistant to W. A. Thomas, president of the Brier Hill Steel Co., Youngstown.

Frank W. Jones, for several years assistant Philadelphia sales agent of the Eastern Steel Co., has succeeded P. R. Foley as Philadelphia sales agent, with office in the Pennsylvania building, Philadelphia.

F. N. Hibbits, formerly superintendent of motive power of the Lehigh Valley railroad, with headquarters at South Bethlehem, Pa., has resigned to become assistant general manager of the Baldwin Locomotive Works, Eddystone, Pa.

J. M. Stutter, at one time connected with the Republic Iron & Steel Co., Youngstown, has been appointed superintendent of the bolt works of that company at Muncie, Ind. Mr. Stutter recently has been engaged in business at Cincinnati.

Joachim G. Giaver, for 17 years chief engineer of structural design for D. H. Burnham & Co., Chicago, has opened offices as consulting engineer at 1751 Railway Exchange building, Chicago, and will specialize in structural design, foundations and building engineering.

W. G. Maguire, who has been in charge of the St. Louis office of the Domhoff & Joyce Co. for the past seven years, has resigned. George K. Connelly, who has been with the Cincinnati office of the company for two years, is temporarily in charge at St. Louis.

P. R. FOLEY,
General Manager of Sales, Eastern Steel Co.

N. L. Heinz has been engaged by the American Steel & Wire Co. to design and to superintend the construction of the new spelter manufacturing plant to be erected at Donora, Pa. Mr. Heinz designed and assisted in the construction of a plant of similar character recently built by the American Zinc & Chemical Co. at Langeloth, Pa.

W. B. Topping, manager of sales of the Republic Iron & Steel Co. in the Cleveland district, has been appointed assistant general manager of sales, succeeding G. F. Alderdice, resigned. Mr. Topping's successor at Cleveland will be W. E. Collier, of the company's sales office at Birmingham, Ala. The changes are effective Aug. 1.

John M. Jamison, president of the Jamison Coal & Coke Co., Pittsburgh, has gone to France to confer with officials of that country regarding shipments of coke and coal to European ports. The French, Italian and British governments have been figuring in the American market since the outbreak of the European war in an effort to purchase coal and coke tonnages.

William T. Dunn, formerly tool steel expert in Boston and New England for the Carpenter Steel Co., has been appointed by the International High Speed Steel Co., New York, district sales agent for New England and eastern Canada. Fred W. Kronenberg has been appointed district sales agent for Colorado, Idaho, Wyoming, South Dakota, Arizona, New Mexico and Texas.

The Pittsburgh Traffic Club last week presented W. A. Sproull with two silver service trays as appreciation of his enthusiastic work for the club the last few years. Mr. Sproull, who was traffic manager of the Cambria Steel Co., resigned that position and the presidency of the Traffic Club a month ago to take charge Aug. 1 of the traffic and transportation bureau of the Philadelphia chamber of commerce.

Lewis F. Schoemaker & Co., Pottstown, Pa., recently have purchased an automatic spacing table for heavy bridge work from the Standard Bridge Tool Co., Pittsburgh. The table is designed to punch plates up to eight feet wide, also two pairs of 8 x 8-inch angles, up to 90 feet in length. The Standard Bridge Tool Co. has taken a contract for a quiet acting table for installation in the plant of the Greenville Steel Car Co., Greenville, Pa., and similar equipment has been purchased by the Case Crane & Engineering Co., Columbus, O.

The property of the York Bridge Co., York, Pa., has been sold by the receivers to a creditors and stockholders' committee for $30,050. It is believed that the plant will be put in shape for an early resumption of operation.

On Eve of Great Events in War

England Awaiting Developments With Keenest Interest —British Imports Very Heavy

Office of *The Iron Trade Review*,
Prince's Chambers, Corporation St.,
Birmingham, Eng., July 17.

The general feeling here and in France is that we are on the eve of great events likely to have an effect on the duration of the war, if not on its result. Tremendous preparations are being made on both sides. The movement to extend munition manufacture has been exceedingly successful, some 70,000 skilled workmen having been enrolled, according to latest reports, and they are getting to work. In the next three months the effects of this increased output should be felt.

The trade returns for June are considered satisfactory. Despite the German submarine campaign, British imports were the largest on record, surpassing the previous record by £2,000,000 in December, 1912., the figures being £76,000,000 and £74,000,000, respectively. Our exports, of course, show a serious falling off, especially in pig iron and finished iron and steel. Following are a few comparisons:

Pig iron.—June, 1915, 39,127 tons; June, 1914, 88,569 tons.

Iron (wrought), in bars, angles, shapes, or sections.—June, 1915, 8,537 tons; June, 1914, 7,517 tons.

Galvanized or corrugated sheets.—June, 1915, 25,091 tons; June, 1914, 47,860 tons.

Wire (iron or steel).—June, 1915, 2,627 tons; June, 1914, 4,427 tons.

Copper.—June, 1915, £167,743; June, 1914, £280,467.

Tin.—June, 1915, £239,922; June, 1914, £173,889.

Lead.—June, 1915, £79,174; June, 1914, £70,447.

Zinc.—June, 1915, £18,043; June, 1914, £22,444.

Plated and Gilt Wares.—June, 1915, £43,895; June, 1914, £79,678.

Cycles and parts thereof (except motor cycles).—June, 1915, £126,963; June, 1914, £152,668.

Motor-cars (including motor-cycles, chassis, and parts).—June, 1915, £304,140; June, 1914, £443,459.

Black sheets.—June, 1915, £72,424; June, 1914, £52,087.

Black plates.—June, 1915, £38,634; June, 1914, £62,313.

Hoops and strips.—June, 1915, £56,249; June, 1914, £26,463.

Cast iron and manufactures thereof.—June, 1915, £80,169; June, 1914, £79,260.

Steel bars, angles, rods, etc—June, 1915, £614,769; June, 1914, £224,398.

Wrought iron and manufactures thereof.—June 1915, £60,723; June, 1914, £104,463.

Tinned plates and sheets. — June, 1915, £506,806; June, 1914, £500,347.

A striking reduction is that of galvanized sheets, of which those in the iron and steel trade will require no explanation. Naturally great interest is taken here in the suggestions by various American trade papers that German financial interests are responsible for the enormous buying of spelter and lead, and that the object of this is to hamper the allies and those engaged in supplying them with ammunition.

Pig Iron Market

The British pig iron market continues to be decidedly unsatisfactory in comparison with other branches of the iron and steel trade. There has been a slight improvement during the week in Cleveland, and buyers are showing a little more interest in forward business, but makers want better prices before they will look at such proposals. A beginning seems to have been made as stock has been reduced since the beginning of the month by 3,300 tons. Shipments are comparatively poor, totalling 4,000 tons for the first week. The demand for foundry iron is rather poor in spite of the activity of war engineering. There was a decline yesterday on the Middlesbrough market of 5d (10c) making the selling figure 67s 6d. ($16.20). At the quarterly meeting yesterday, many smelters declared they would either stop their pig iron or blow out further furnaces, and it seems very likely that the latter course will be adopted. Ferro-manganese continues scarce and sells at £20 ($96) per ton for 80 per cent qualities.

The quarterly meeting of the iron trade in Birmingham yesterday afforded a good opportunity to estimate the general position of the trade. While the market was fairly attended, many manufacturers were not present, apparently preferring to stay at home facilitating execution of orders. No great amount of business resulted, manufacturers generally being careful not to overbook themselves. As a rule, buyers also were inclined to take a somewhat cautious attitude. American steel is coming in increasing quantities, a usual quotation is £7 5s ($34.80) c. i. f., as against British £7 15s ($37.20), delivered. The difference is slightly to the advantage of the buyer of American material, and orders would be placed in greatly increased quantities if deliveries were somewhat more regular. The trouble is mainly with railway deliveries from the ports. The congestion on the home railways is so great that foreign steel is most difficult to obtain.

For high speed steel the demand is far beyond the capacity of makers in Sheffield and elsewhere.

The tinplate trade of South Wales was strongly represented at Birmingham the makers reporting great pressure for delivery, and steadily rising prices.

New Shaft

Will be Built at the Richard mine of the Thomas Iron Co.

Important improvements which will largely increase the output of the property have been ordered by the Thomas Iron Co. for its Richard iron mine at Wharton, N. J. The principal feature of these betterments will be the sinking of a new and thoroughly modern vertical shaft. This will be 7 x 21 feet in dimensions and will have four compartments. It will be concrete lined to bed rock and will be sunk a depth of 1,100 feet. It will be equipped with electric hoist and steel headframes. The addition of this shaft will increase the output of the mine to about 20,000 tons of ore monthly as compared with 8,000 tons monthly at present. The new shaft will be located so that it will serve not only the unmarked territory of the Richard mine but also 38 acres which have been leased by the Thomas Iron Co. from the Wharton Steel Co., adjoining its property on the east. It will facilitate the mining of the new veins in the Richard mine discovered in June, 1914, at the east side of a fault. At the present time, there are seven shafts and slopes in the Richard mine, but only two of these are active. Ore is being obtained on four levels. The No. 5 opening has been extended to 1025 feet. The new vertical shaft will strike this at a depth of 700 feet and will extend 400 feet below. Other improvements to the Richard mine are in contemplation by the Thomas Iron Co. The engineer in charge of the building of the new shaft is W. Spencer Hutchinson, of Boston.

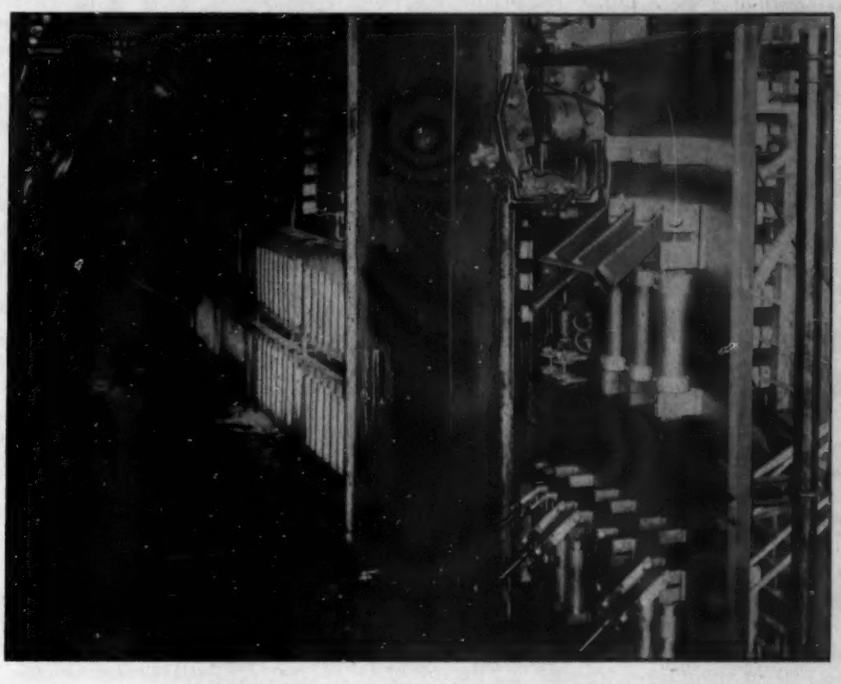
The plant of the Allentown Foundry & Machine Co., Allentown, Pa., which has been idle for several years, has been leased by the Griffin Mill Co., manufacturers of cement machinery.

Using Electric Ovens for Enameling

Details of an Interesting Innovation in Enameling Practice Made by Toledo Automobile Builder

THE use of electricity in iron and steel plants for heating purposes has shown a rapid growth in recent years. Numerous installations have been made, covering a wide field of operation. This type of heating medium has proved satisfactory not only for handling the raw material but especially for the finishing of high grade products. The latest application is its use for enameling.

The first installation of electric ovens for enameling purposes has just been made by the Willys - Overland Co., Toledo, O. Six ovens have been installed and put in operation and provision has been made for the immediate construction of 42 additional. Among the advantages claimed for these ovens over the gas-fired type is increased production, lessened fire risk and an increase in quality of enameling due to the absence of air suction. These ovens range from 20 feet wide, 30 feet deep and 7 feet 5 inches high to 20 by 20 by 7 feet 5 inches. They can hold 50 full sets of automobile fenders. They are lined with asbestos and are of steel construction, floored with ¼-inch plate. The ovens are separated by heavy steel plates, insulated with 2-inch kisselgore blocks on all sides and on the top.



ENAMELING FENDERS IN ELECTRIC OVEN

Although the capacity of these ovens depends largely upon the form of the material which is being enameled, it is estimated that each oven can handle 10,000 pounds of metal per day, a total of between 400,000 and 500,000 pounds for the 48 ovens. The time of enameling has been reduced from four hours and 15 minutes to two hours and 40 minutes, a decrease of one hour and 35 minutes or 37 per cent. On this basis, each oven shows an increased production of approximately 40 per cent. In the enameling room of the Willys-Overland Co., the products are given two coats. The first coat is at 390 degrees Fahr. and the finishing coat at 400 degrees Fahr. With gas ovens it required one hour and 45 minutes for the first coat and two hours and 30 minutes for the finishing coat, a total of four hours and 15 minutes. With the electric ovens operating at the same temperature, the first coat is completed in one hour and 15 minutes and the finishing coat in one hour and 25 minutes, a total of two hours and 40 minutes. In addition, the operators at the Overland plant claim that some difficulty was previously experienced with the gas ovens due to the shriveling of the enameled product. This trouble, it is said, has been eliminated since the installation of the electric ovens. Due to the necessity of furnishing air to the gas burners, it is claimed that dust particles were occasionally blown onto the products while they were being enameled. With the electric ovens of course no draft is required. A small flue is provided for carrying off the fumes from the enamel.

Power for heating the ovens is secured from the Toledo Railways & Light Co., being brought into the plant in four underground cables at 23,000 volts. For service in the enameling ovens, it is stepped down to 440 volts, 25 cycles, three phase. With the installation of these ovens, the Willys-Overland Co. will have a connected enamel oven load of about 20,000 horsepower.

The heating coils, which are clearly shown in the accompanying illustration, are each 44 inches long, 3¼ inches thick and 16 inches high. The coils are wound with flat resistance ribbon on oblong spools and are mounted on iron racks, from 3 to 4 inches above the floor level. Eight of the coils are connected to form a unit. There are three rows of coils in each oven, one row at each side and one through the center. The energy required to heat each oven is from 240 to 390 kilowatts, 10 kilowatts being required for each unit and there being an average of from 18 to 39 units to an oven. The coils were furnished by the General Electric Co. Each oven is provided with an automatic temperature cut-off, which cuts off the current when the temperature reaches the required degree. An electric light mounted over the door of each oven, is automatically lighted when the oven is in operation. Each oven is provided with an automatic door switch, the current being shut off when the door is opened, avoiding any danger of shock to the workmen. Correct temperature control is secured through pyrometers furnished by the Brown Instrument Co., Philadelphia. The increased production is about 40 per cent. Initial cost of installation is from nine to 10 times greater for the electric oven than for the gas oven. This cost, however, is not prohibitive, as little equipment is required for gas ovens beyond piping and burners.

How to Select Etching Reagents

Details of Principal Reagents for Etching Iron, Steel and Non-Ferrous Metals With Instructions for Their Correct Manipulation

BY O. F. HUDSON

THE EXAMINATION with the microscope of suitably prepared specimens has become one of the most profitable methods of investigation in studying the properties of metals and alloys, and is also a valuable means of controlling the manufacture of metallic articles and of testing the finished products.

The preparation of the specimen is carried out in the following stages:

1.—Selection and removal of a piece of the material of suitable size and shape.

2.—Filing or grinding a perfectly flat surface which is to be examined by the microscope.

3.—Polishing the selected surface, usually by fine grinding on emery papers of increasing degrees of fineness, followed by wet polishing with a special polishing powder such as rouge, alumina, etc.

4.—Treatment of the polished surface in order to reveal clearly the internal structure of the metal when the specimen is examined by the microscope.

The present paper is particularly concerned with the final stage in the preparation of the specimen, although the effects of the previous operations cannot always be ignored.

Commonly the methods employed to reveal the structure on the polished surfaces of metallographic specimens make use of the selective action of suitable solvents, and hence the term etching reagents. Even in the case of a perfectly pure metal or an alloy consisting of a single uniform constituent, a solvent will not attack the surface uniformly but will dissolve the crystals at different rates, so that after the attack there will be slight differences in level in passing from one crystal to another, the boundaries of the crystals showing up as black lines when the specimen is examined under vertical illumination. The appearance of the crystal boundaries as black lines may also be due in part to the more rapid solution of the metal immediately at the boundaries of the crystals, thus giving rise to a very narrow channel separating adjacent crystals. When an alloy consists of two or more constituents their outlines will be revealed for similar reasons, and if the method is a simple etching the constituents will be distinguished by differences in appearance, that is, color, or arrangement. Generally speaking, the attack of the etching reagent also produces more or less pronounced roughening of the surface of each crystal and staining due to a film of oxide. In a single constituent material this surface staining serves to distinguish each crystal by differences of tint or depth of color produced, while in an alloy of two or more constituents certain constituents are stained, (darkened) while others are unaffected or stained to a markedly different extent. Most metallographists freely make use of such staining as a means of identifying the constituents. The author, however, prefers in a critical examination of any alloy of two or more constituents to avoid (although this is not always possible) any staining and to identify a constituent by some intrinsic property, such as a characteristic color, making use of staining only to confirm previous deductions, or to give contrast for demonstration purposes or for photography. For these reasons the author considers that the method of polish attack is most valuable, whether in the form of a true polish attack such as was used by Osmond, or in the form of alternations of very light etching and very gentle polishing.

What Polishing Does

The results of the etching process may be effected by the condition of the polished surface before etching. Thus it is necessary very briefly to refer to some of the effects of polishing. The mechanism of polishing has been studied by Beilby, whose explanation has been generally accepted, and whose work is well known. A lucid review of our present knowledge of the subject of polishing is given by Rosenhain in a recently published text-book, and in a paper read at the Birmingham meeting of the British Association (Section B) in 1913, entitled "Metals, Crystalline and Amorphous". The production of a perfectly polished surface is the result of an alteration of the surface layers of the metal from the crystalline to a viscous amorphous form. This viscous surface layer becomes spread over the surface of the metal, filling up irregularities, such as holes or scratches, and spreads uniformly under the action of surface tension, giving a surface of a perfect polish. The smooth amorphous layer of metal which constitutes the polished surface is rapidly dissolved by etching agents and the crystalline material beneath exposed. As, however, scratches are not all removed by final polishing, but only covered up by the amorphous layer, the attack of the etching agent may cause the scratches to reappear. It is thus in a number of cases extremely difficult to get a satisfactory etching result. In other cases the presence of an amorphous film is not troublesome in practice. The greater part of the metal converted into an amorphous condition by polishing is reabsorbed at once by the crystalline metal, so that, although true polishing in all cases is the result of disturbance of the surface molecules, the surface after polishing is not necessarily covered by any considerable film of metal in a vitreous amorphous condition. Not uncommonly constituents may be recognized on the untreated polished surface and more or less sharply defined from one another. It is probable that the amorphous metal, mobile only at the moment of polishing, does not spread far and that the vitreous layer is not of uniform composition.

The difficulty of obtaining a surface suitable for etching is generally greater the softer the alloy. In most cases the use of a suitable metal polish for the last stages of polishing will give a surface that is good enough for all practical purposes. The metal polish may be used on chamois leather, or a little may be rubbed lightly on the specimen with the end of the finger, this being the better method for the final stage of the polishing.

As an example of the modifications of usual methods which may be found necessary in special cases, the following account of the polishing of aluminum and its softer alloys may be given:

"The chief difficulty attendant upon the polishing of pure aluminum and its softer alloys is the trouble which is experienced with the retention in the polished surface of the metal of the emery from the finer grades of pol-

A paper presented at the recent annual meeting of the Institute of Metals, London, England. The author, O. F. Hudson, is a professor at the University of Birmingham.

ishing papers, as it is practically impossible to remove it subsequently on the wet polishing wheel. Professor Carpenter has obtained good results by the substitution of ordinary blotting-paper in the place of the final emery-paper, but the writer has never been able to achieve success with this method, and has, in fact, now abandoned dry polishing entirely. With the softest aluminum the writer has obtained excellent results following the procedure here given:

"1.—Fine file kept thoroughly wet with paraffin oil.

"2.—No. 1 emery-paper, soaked in paraffin, on wooden board.

"3.—No. 2 emery-paper, soaked in paraffin, on wooden board.

"4.—Diamantine powder on cloth-covered polishing-wheel, kept thoroughly moist with water and also maintaining the supply of polishing powder.

"5.—Globe metal polish on 'selvyt' cloth, on polishing-board, rubbing lightly. It may be found on examination that there has been some appreciable surface flow, in which case it is necessary to revert to No. 2, or possibly even No. 1 emery-paper and repeat all the above operations. This does not, however, usually take very long to carry out, and only very light pressure with the hand is required. The final polish before etching for micrographic purposes should be effected with a little metal polish on the finger, rubbing very lightly."

The etching reagents which are used to develop the structure of metals and alloys include the mineral acids and certain organic acids, ammonia and other alkalis, and solutions of certain salts. They are usually more or less diluted with water or another solvent, and the etching effects can be varied and controlled by altering the concentration of the solution or by using different solvents. The influence of the solvent on the power of the etching agent is dealt with by Robin in his "Traite de Metallographie". A reagent is more rapid in its attack when the degree of ionization is increased. There is a relation between the ionizing power of the solvent, influenced by viscosity and other factors, and the speed of attack of the reagent. Picric acid, for example, in solution in liquids of high viscosity, such as amyl alcohol or glycerine, has a slow, though very clear, etching effect. A very slow rate of etching, however, is usually inconvenient, and water and ethyl alcohol are the most generally used solvents.

Before the specimen is immersed in the etching solution, care should be taken to observe that the surface is perfectly clean and free from any trace of grease. It is most important that the etching solution should immediately come in contact with every part of the surface, as otherwise uneven and possibly misleading effects may be obtained. Washing with a dilute solution of caustic soda or caustic potash, or with ether, will insure the removal of all grease.

What to Do After Etching

The treatment of the specimen after it has been acted upon by the etching reagent is also a detail to which attention must be paid. When the etching has proceeded to the desired extent, the specimen is at once washed thoroughly in order to remove all trace of the etching reagent. Usually it is simply rinsed with water, but frequently the washing is done with absolute alcohol, while ether and chloroform are also sometimes used. As soon as the washing is finished, the specimen should be dried quickly to prevent any undesired staining or tarnishing. Generally an old handkerchief may be safely used for this purpose, but if alcohol or other volatile liquid has been used for washing, the specimen may be dried naturally in air or by allowing a current of air, which may be warmed, to play upon the surface. This latter method is especially desirable where it is required to retain some surface deposit liberated by the etching reagent, as, for example, carbon liberated from steel.

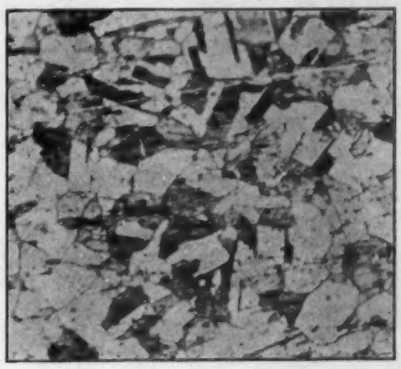


FIG. 1—STRUCTURE OF ELECTRO-ETCHED RESISTANCE WIRE

Magnified 150 diameters.

Copper, 57.88 per cent; Nickel, 41.61 per cent; Iron, 0.12 per cent; Manganese, 0.28 per cent; Carbon, 0.06 per cent; Sulphur, 0.03 per cent; Phosphorus, 0.01 per cent; Total, 99.99 per cent.

The Etching Reagents Used

In the following account, the individual etching reagents for iron and steel are first described and afterward those suitable for non-ferrous metals and alloys are covered. There are also included separate short sections devoted to electrolytic etching, "polish attack" and "heat tinting" methods.

The number of reagents which are used or have been proposed for etching iron and steel is very large, and it is only intended to deal with the more important of them here. Many of the reagents are used to identify some particular constituent of steels or in the examination of steels which have received some special treatment.

Copper Ammonium Chloride.—This reagent, introduced by Heyn, usually consists of a 10 per cent solution of the salt in water, and is suitable for wrought iron and mild steel. The specimen is immersed in the solution for about one minute, then washed, and the copper deposit, which is readily detached, wiped off under running water. This reagent is used for deep etching effects, and also to darken parts rich in phosphorus. Henry M. Howe uses this reagent (1 part of the double salt to 12 parts of water) for low carbon iron and steel. He finds that it "shows grain boundaries readily, but rather obscures Neumann lines," and that it is the best reagent for etching figures and pits. Hoyt uses a similar solution "principally for microscopic examination of low carbon steel, wrought iron, white cast iron, and in the determination of phosphor segregations in wrought iron."

Copper Chloride. — Dilute acidulated copper chloride in alcohol is used by Stead to detect phosphorus in steels. The reagent is made up as follows:—

	Grams.
Copper chloride	10
Magnesium chloride	40
	Cubic Centimetres.
Hydrochloric acid	20

The salts are dissolved in the least possible quantity of water, and the solution made up to 1,000 cubic centimeters with alcohol. The purer portions of the steel become coated with copper before the phosphoric portions.

Hydrochloric Acid.—A dilute solution, 1 per cent in ethyl alcohol, is generally used. Hoyt writes that a solution of 1 cubic centimeter hydrochloric acid, specific gravity 1.19, in 100 cubic centimeters absolute alcohol "is recommended for all the iron-carbon alloys whether in a hardened or annealed state," while the action can be accelerated for special steels by the addition of a few cubic centimeters of a 5 per cent solution of picric acid in alcohol. Howe uses a solution of five cubic centimeters of concentrated hydrochloric acid in 95 cubic centimeters of ethyl alcohol.

Iodine.—The use of iodine was suggested by Osmond, who used the ordinary tincture, and this is the form in which it should be used. A simple solution in absolute alcohol is not so suitable. The specimen may be immersed in the solution or a drop or two

placed on the surface to be etched, and allowed to remain until decolorized.

Nitric Acid.—Until the introduction of picric acid, a dilute solution of nitric acid was the principal etching agent for iron and steel, and it is still very often used. It was used by Sorby, Roberts-Austen, Osmond, and most of the earlier investigators; Arnold, Howe, Sauveur, and others use it, and many still consider it to be the best general etching agent for iron and steel. Solutions up to about five per cent in water, or, preferably, alcohol, are generally used. When alcohol is the solvent, absolute alcohol should be used for washing the specimen, and not water. Lantsberry, who always uses nitric acid for steels, points out that the success of the method depends on thoroughly washing the specimen with alcohol and drying at once, and that the surface should never be moistened with water.

Sauveur writes that for all grades of steel, wrought iron and pig iron, regardless of treatment, he uses solutions of concentrated nitric acid in absolute alcohol, in proportions varying between 1 and 10 per cent of acid, according to requirements. He prefers it to picric acid. The samples are washed in absolute alcohol and dried by means of an air-blast. For manganese steel he uses 10 per cent nitric acid in absolute alcohol, leaving the specimen in the bath until it is covered with a black deposit. It is then washed in alcohol, without any attempt at removing the deposit by rubbing.

Howe uses a solution of 2 per cent of concentrated nitric acid in water for hardened steels, manganese steels, etc., and also occasionally to develop grain boundaries quickly in low carbon material, although he notes that it roughens up the ferrite much more than picric acid. He recommends a preliminary treatment for the removal of grease, using "alcohol, hydrochloric acid in alcohol, or, best, picric acid in alcohol".

Hoyt remarks that "nitric acid is particularly serviceable for determining the grain size of known steel and the final temperature at which it has been worked, but for micrographic analysis is a dangerous reagent. Its indications ought to be confirmed by other means".

A 4 per cent solution of nitric acid in iso-amyl alcohol, as suggested by Kourbatoff, is also used, and gives a slow and delicate etching. Hoyt uses this for "quenched steels, tempered steels and to examine the structure of nickel steels", and Desch states that he uses this solution principally for the etching of hardened steels.

Picric Acid. — This reagent, introduced by Ischewsky, is the one most commonly used, generally as a saturated or nearly saturated solution in alcohol. The specimen is immersed for times varying with the kind of steel and the effect desired from a few seconds for light etching of ordinary rolled or annealed steels and cast irons, to several minutes for hardened steels and wrought irons. Picric acid is sometimes used in conjunction with nitric acid. Thus Desch recommends for all ordinary unhardened steels alcoholic picric acid to which a few drops of nitric acid have been added.

In addition, a solution of picric acid in amyl alcohol is also used for a slow etching. L. Archbutt also finds it "an advantage to add a small quantity of nitric acid, which gives greater certainty of etching, especially in cold weather". The solution he uses contains 80 volumes of picric acid in alcohol and 20 volumes of 2 per cent nitric acid in alcohol.

Rosenhain's and Haughton's reagent consists of—

	Grams.
Ferric chloride	30
Cupric chloride	10
Stannous chloride	0.5
Water, cubic centimeters	1,000
Hydrochloric acid (conc.)	100

It is used for determination of the distribution of phosphorus in steel, the purer portions of the steel being stained by deposition of copper, leaving the phosphorus-rich portions white.

Of the numerous other reagents some are used for special purposes, such as sodium picrate, for the detection of cementite; while others are more or less complicated solutions, such as Kourbatoff's reagent, consisting of three volumes of a saturated solution of 0-nitrophenol in alcohol and one volume of a 4 per cent solution of nitric acid in alcohol, used for the determination of troostite and sorbite in hardened steels.

Electrolytic Etching

Electrolytic etching is of great value in special cases. Generally a solution of a neutral salt is used as the electrolyte; the specimen is made the anode and a piece of platinum foil the cathode. A feeble current of a small fraction of an ampere is used.

Desch finds that etched figures in brasses, etc., are most perfectly developed by electrolytic etching, using a 5 per cent sodium chloride solution and a platinum cathode with two dry cells.

Other electrolytes used are ammonium nitrate, sodium thiosulphate (this having been used by Le Chatelier for copper-tin alloys), ammonia and sometimes very dilute acid solutions.

For Monel metal, L. Archbutt "obtained very good results by electrolytic etching in a solution containing 45 cubic centimeters dilute sulphuric acid (1:3) and five cubic centimeters hydrogen peroxide solution, using a current of 0.1 ampere and 0.5 volt, etching for about 50 seconds. A slight staining of the specimen was subsequently removed by light rubbing with a dilute solution of bromine in hydrochloric acid". Constantan was etched in a similar way, "but stains were removed by using a mixture of dilute sulphuric acid and hydrogen peroxide and rubbing with the finger". The two specimens reproduced in Fig. 1 illustrate the value of this method. Rosenhain has also found that electrolytic etching is useful for nickel-copper alloys.

A dilute aqueous solution of ammonia is used for copper, brass and other alloys of copper rich in copper. Simple immersion for a short time in strong ammonia (0.880) diluted with about its own bulk of water generally serves to develop the structure. The copper is oxidized and dissolved in the ammonia, leaving the crystals stained and colored to different degrees in the case of pure copper and alloys consisting of only one constituent. With alloys consisting of two or more constituents, certain constituents are darkened in preference to others, and so may be distinguished. Ammonia used in this way has the disadvantage that the staining is not always under control; it may be excessive and misleading. The etching power of ammonia is increased by the addition of a little hydrogen peroxide, although the results obtained are not always improved. Desch recommends rubbing the ammonia on the specimen. He states that for brasses generally he uses "dilute ammonia rubbed on lightly and evenly with the tip of the finger or a small plug of cotton wool, renewing the liquid occasionally. This develops the structure better than any other method, and does not produce great differences of level". Sauveur uses bromine water in conjunction with ammonia. The author finds ammonia suitable for copper and its alloys, particularly brasses. The method employed is to rub the specimen with ammonia on parchment. The parchment is thoroughly moistened with water, and then spread on a smooth wooden support. Three or four drops of dilute ammonia (1 part strong ammonia to 1 part water) are sprinkled on the parchment, together with a little freshly ignited magnesia made from carefully prepared and thoroughly washed magnesium carbonate. The specimen is then rubbed gently but steadily, usually with a circular motion, on the parchment for

a short time, say 15 seconds—washed thoroughly, dried quickly on old clean linen and examined. If necessary, the operation is repeated. This method is a true polish attack, and, by suitably varying the amounts of ammonia and magnesia and the strength of the rubbing the crystals may be darkened to different degrees, or the constituents may be seen quite unstained and clearly outlined.

For many copper alloys the author prefers this method even to the use of ammonium persulphate, but it must be admitted that a little practice and experience are required to obtain uniformly satisfactory results.

Ammonium persulphate is one of the most useful etching agents for copper alloys, and was first suggested by E. F. Law, from whose book on "Alloys" the following is taken:

"The etching is effected by simple immersion of the specimen, no rubbing being required as in the case of some other etching agents. This is an important consideration with soft alloys, which are very easily scratched by rubbing. The action takes place without formation of gas bubbles, which are always liable to adhere to the polished surface and cause uneven etching. One precaution, however, must be observed in the use of ammonium persulphate—the polished surface must be absolutely free from oil or grease."

Reagent for Platinum

Aqua regia is used for gold and platinum and their alloys. Sir Thomas K. Rose has supplied the following details of the method he employs: The reagent is made up of "nitric acid one part, hydrochloric acid five parts, distilled water six parts. Use about 15 degrees Cent. The etching is slow, and its progress can be watched. Pure gold is etched sufficiently for oblique illumination in about one hour. This works well with cast gold, or hammered or rolled metal and also annealed specimens, without preparation except removal of grease. With polished specimens the results are less certain, but are more uniformly good than with stronger or hotter acids. With this strength and temperature, the presence of gold chloride in the acid appears to have no influence on the result. Alloys of gold and silver, gold and copper, etc., containing over 90 per cent of gold, are equally amenable to this reagent."

Bromine Water. — Sauveur uses this reagent for copper and certain of its alloys rich in copper. "The specimens are first etched in bromine water, and this is followed by a wash in ammonia, the surface of the specimen being rubbed gently with the finger while remaining in the ammonia bath." Cupric ammonium chloride was introduced by Heyn, and is used for steels and for copper and its alloys. The solution is made by adding ammonia to a solution of 5 grams of cupric chloride in 100 cubic centimeters of water until the precipitate is dissolved. Desch writes that: "For copper, the best deep etching results from ammoniacal copper ammonium chloride prepared according to Heyn's directions." Hoyt uses a basic solution of copper ammonium chloride for etching copper and its alloys; 10 grams of copper ammonium chloride are dissolved in 120 cubic centimeters of water, and the solution is treated with ammonia until the precipitate which forms just goes into solution, giving a clear blue color.

Ferric chloride, introduced by Heycock and Neville for etching copper-tin alloys, is very widely used for copper alloys generally. The strength of the solution and the amount of hydrochloric acid present vary considerably, and what is considered the most suitable composition for any class of alloys is commonly found by trial. Although as a rule preferring other reagents, the author also uses ferric chloride and hydrochloric acid for many of the copper alloys—bronzes, aluminum-copper alloys, German silver, phosphor bronzes, etc.—but not often for brasses. No rule is followed in making up the solution, but generally a few drops of strong hydrochloric acid are added to about 5 cubic centimeters of a strong (syrupy) solution of ferric chloride and water added to give an orange-colored solution. Desch recommends ferric chloride for bronzes and aluminum-copper alloys. He generally uses concentrated hydrochloric acid to which a few drops of a stock laboratory solution of ferric chloride have been added, but it is sometimes necessary to dilute slightly with water. He finds the best composition in each instance by trial. He also notes that "ferric chloride has an astonishing power of revealing latent scratches", a characteristic that was also observed by Heycock and Neville. This disadvantage, however, is shared by most etching agents in a greater or less degree.

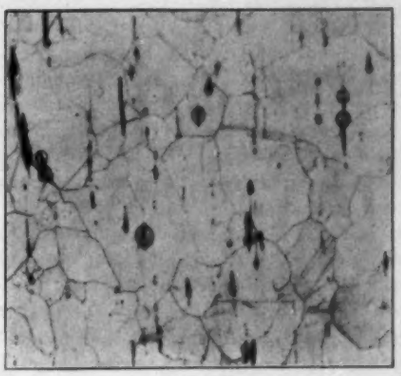


FIG. 2—STRUCTURE OF ELECTRO-ETCHED MONEL METAL

Magnified 150 diameters.

Copper, 33.18 per cent; Nickel, 64.32 per cent; Iron, 1.82 per cent; Aluminum, 0.02 per cent; Zinc, 0.05 per cent; Manganese, 0.20 per cent; Silicon, 0.33 per cent; Phosphorus, 0.04 per cent; Total 99.96 per cent.

Etching With Hydrochloric Acid

Hydrochloric acid is used for white metals containing high percentages of tin. Either the concentrated or dilute acid may be used. In the former case the specimen is dipped in the acid for a few seconds, and when sufficiently etched, washed thoroughly and dried quickly on a soft rag. When the dilute acid is used for rich tin alloys the concentration of the acid may be varied according to the composition of the alloy. Gwyer finds that hydrochloric acid is suitable for the iron rich aluminum-iron and the tin rich aluminum-tin alloys. He states that the exact strength is best found by trial, and should be so regulated that the evolution of gas bubbles is fairly brisk, a comparatively short time of immersion appearing to answer the best.

Hydrofluoric acid was introduced by Brislee for etching aluminum. One part of fuming hydrofluoric acid is added to 10 to 20 parts of water. After treatment in this solution the specimen should be cleared by dipping it for a few seconds in strong nitric acid and then washed and dried. Gwyer finds this method "most valuable on account of the beautiful manner in which it develops the structure of pure aluminum—cast, worked or annealed". Rosenhain uses this reagent for aluminum and its alloys, and finds that a solution of hydrofluoric acid, one to eight, followed by immersion in 60 per cent nitric acid is very satisfactory, particularly for revealing the crystalline structure of pure aluminum and of homogeneous solid solutions.

Nitric acid is used sometimes for etching copper alloys, and is found useful for the rapid etching of 70:30 brass for commercial purposes when crystal size is to be judged. Probably the best way to use it for this purpose is to dip the specimen momentarily in strong acid and wash at once under the tap. Gwyer also finds that the concentrated acid gives excellent results with the copper-rich aluminum-copper-alloys.

Rosenhain states that "both for copper and zinc-copper very brief etching with nitric acid gives useful indica-

tions. While the general structure is revealed, there is also a vigorous pitting action which occurs wherever undissolved foreign matter is present, such as specks of oxide or, more particularly, of lead in brass. Such enclosures are very minute before etching, and are developed into prominent black patches by the action of nitric acid". Rosenhain also uses this reagent for pure lead, which "is satisfactorily etched by prolonged immersion in dilute nitric acid in water (5 to 10 per cent). If the etched surface is dull it can be brightened by laying the specimen in water with the etched surface just immersed and pouring on a small quantity of strong nitric acid. This at first produces a deep tarnish which is rapidly removed by agitating the water. Nitric acid is also useful in etching alloys of lead and tin, and such alloys as type metals and bearing metals".

Nitric acid of 1.2 specific gravity is used by L. Archbutt for white metals, the structure usually being developed well in 10 seconds.

Iodine is found by Gulliver to be most suitable for alloys rich in zinc or cadmium. He uses a solution of 1 part iodine, 3 parts potassium iodide in 10 parts of water.

Caustic potash and caustic soda are used for zinc and aluminum and alloys rich in these metals. At the British National Physical Laboratory "caustic soda is found satisfactory for etching the alloys of aluminum with zinc, copper, manganese, etc. This reagent, however, often leaves a black deposit on the etched surface. This can be very satisfactorily removed by dipping the specimen in a solution of chromic acid in water." Concerning the use of caustic soda, Gwyer writes that "This reagent, in strengths varying from 5 to 20 per cent, is the most generally employed for aluminum, and aluminum rich alloys. It usually gives good results, provided that the specimen is not immersed too long, when pitting will ensue, and the black deposit liberated by its action is instantly removed by dipping the specimen, after rinsing off excess soda in running water, in concentrated chromic acid, a method originated by S. L. Archbutt, of the National Physical Laboratory."

A 5 per cent solution of silver nitrate in water may be used for alloys of lead, tin, antimony, bismuth. The black deposit left on the surface is washed off. Hoyt states that he uses this reagent for anti-friction alloys.

The objections which appear to be urged against the polish attack method are the difficulty of getting uniformly good results, and the danger of obscuring the structure by the flowing action of polishing. Neither of these objections need, however, be serious; the former is overcome by experience, while the latter is probably largely imaginary, unless altogether unnecessary pressure is used. For steels Osmond used a very gentle etching reagent, such as a 2 per cent solution of ammonium nitrate which precipitated calcium sulphate in parchment, but this method is not now so often used. The author, however, for iron and steel, makes use of parchment thoroughly soaked in water on which a paste of precipitated calcium sulphate is spread. The specimen is then alternately lightly etched with picric acid and rubbed gently for a few seconds on the parchment. Frequently also it is found to be an advantage to etch the specimen lightly, then polish very gently with alumina and re-etch, repeating if necessary.

Gwyer finds that polish attack is sometimes very effective for light aluminum alloys, "for example, in bringing out the structure of the iron-aluminum eutectic. For this washed and ignited magnesia is required, the polishing being done on parchment kept moistened with very dilute caustic soda solution".

Gulliver notes that sometimes a good polish attack may be obtained with water alone, although not if the pad is new. He found, for example, that polish attack with water alone was effective in the case of bismuth-tin alloys.

Heat Tinting

Although not perhaps, strictly speaking, an etching process, heat-tinting is a valuable and widely used method of revealing the structure of alloys, and especially for the detection of small differences in concentration of solid solutions. The process was introduced by Stead many years ago, and has been considerably developed by him since. It consists in heating the specimen until a thin film of oxide is formed on the surface, differences in composition giving rise to variations in thickness, and hence variations in color of the film. He used it with great advantage in studying phosphoric cast irons and alloys of iron and phosphorus, and showed that by its use phosphide and carbide of iron could readily be distinguished, while Heycock and Neville proved its value in their work on the copper-tin alloys. Stead has also applied the method to the determination of the distribution of phosphorus in steel. In a paper on "Metallographic Methods for the Detection of Phosphorus in Steel", read before the Cleveland (England) Society of Engineers in December, 1914, Stead gives details of the heat-tinting method suitable for this purpose.

The specimen is floated on a bath of molten tin at a temperature of about 300 degrees Cent., and allowed to remain until the whole surface has a reddish-brown color. On examining the specimen, the portions richest in phosphorus will be detected by their blue color, since the parts which are richer in phosphorus than the surrounding metal become colored more quickly.

The preliminary treatment given the specimen before it is raised to the tinting temperature is important. Washing with a 1 per cent solution of picric acid in alcohol is recommended, and the surface should always be cleaned by rubbing with a clean piece of linen or cotton. The specimen is heated to about 150 degrees Cent., and then rubbed with a clean piece of chamois leather while still hot. It is then immediately raised to the tinting temperature.

Instead of heating in air and obtaining a colored oxide film, Stead has shown that other atmospheres may be used, such as sulphuretted hydrogen or bromine. An atmosphere containing bromine is used for the examination of Muntz metal. Heat-tinting appears to require considerable experience in order to obtain consistent results, and the author, among others, cannot rely upon it to be uniformly successful.

The Electro-Steel Co., Curry building, Pittsburgh, has announced the results of a series of tests on piston rods made of steel manufactured by this concern. The tests are said to have been conducted by an eastern railroad. The steel showed a tensile strength of 123,775 pounds per square inch and an elastic limit of 82,600 pounds with an elongation of 24 per cent in 2 inches and a reduction of area of 53 per cent. In a revolution testing machine 984,933 revolutions were required to break the test piece at a stress of 30,000 pounds per square inch. This steel, which contains manganese, is produced in an electric furnace.

The American Sheet & Tin Plate Co., Pittsburgh, Pa., has issued a special guide to the exhibit of the United States Steel Corporation and its subsidiary companies at the Panama-Pacific Exposition, at San Francisco, in the form of an attractive six-page folder. A plan of the Steel Corporation exhibit is shown and a key is presented so that the visitor can readily locate any particular product or process which may interest him.

Tests of Vanadium Iron Castings

Details of Investigation Made at Lafayette College to Determine Characteristics of Castings Made From Vanadium Pig Iron With Varying Amounts of Scrap

SOME interesting tests have recently been made by Prof. Edwin O. Fitch Jr., Lafayette College, Easton, Pa., to determine the effect of vanadium in gray iron castings. No. 2 foundry pig iron made in the furnaces of the Thomas Iron Co., Easton, Pa., was used; it contained an average of 0.04 per cent vanadium and 0.022 per cent titanium, together with 2 per cent silicon. The other elements in the pig iron are given in Table II. Eight series of tests were made in order to determine the characteristics of castings with varying percentages of scrap. The proportion of scrap ranged from nothing up to 80 per cent. Two tests were made on semi-steel, there being 10 per cent steel and 40 per cent gray iron scrap in one of the mixtures and 20 per cent steel with 30 per cent gray iron in the other. The same gray iron scrap was used in the first six tests, a different scrap being employed in the semi-steel tests. In the words of Prof. Fitch, "The object of the tests was to determine the physical characteristics of the iron itself and when mixed with different proportions of scrap, and to determine the most economical mixture of pig iron and scrap for different classes of castings."

In making the castings ordinary foundry conditions were duplicated as far as possible. A 35-inch Colliau type cupola installed in the foundry of the department of mechanical engineers of Lafayette College was used. Jamison 72-hour foundry coke was employed in all of the tests. No flux was used. It not being necessary to cast a large quantity of metal, only one round was charged for each test. Approximately 900 pounds of iron were melted in each test.

Making the Tests

The tests given in the specifications of the American Society for Testing Materials for gray iron castings were made with the following exceptions. The arbitration bar described in these specifications is 15¼ inches by 1¼ inches in diameter with 1/16-inch draft. The tensile specimens, however, call for a finished outside diameter of 1¼ inches. In order to obtain a standard tensile specimen, it was thought best to make the test bars 1½ inches in diameter. This made it possible to turn up the tensile test bars from the bars broken in the transverse tests.

It was not possible under these conditions to compare the breaking loads with those given in the American Society for Testing Materials' specifications. Nevertheless the figures covering the breaking loads are interesting as an indication of the strength and resiliency of vanadium iron castings and they are therefore included in Table I. In order, however, to compare the results obtained from the transverse tests with the requirements of the specifications, the moduli of rupture (outer fiber stress in pounds per square inch) were computed and compared with the calculated moduli of rupture of the specified arbitration bars, using the breaking load specified for the different classes of castings.

In order that the results given in the accompanying tables may be readily compared, the following data are recapitulated from the standard specifications for gray iron castings of the American Society for Testing Materials.

These specifications state that castings having any section less than ½-inch thick shall be known as light castings; castings in which no sections are less than 2 inches thick shall be known as heavy castings, medium castings being those not included in the foregoing classifications. A minimum of 0.08 per cent sulphur is specified for light castings; an increase to 0.10 per cent is permitted for medium castings and 0.12 per cent is allowed for heavy castings. The quality of

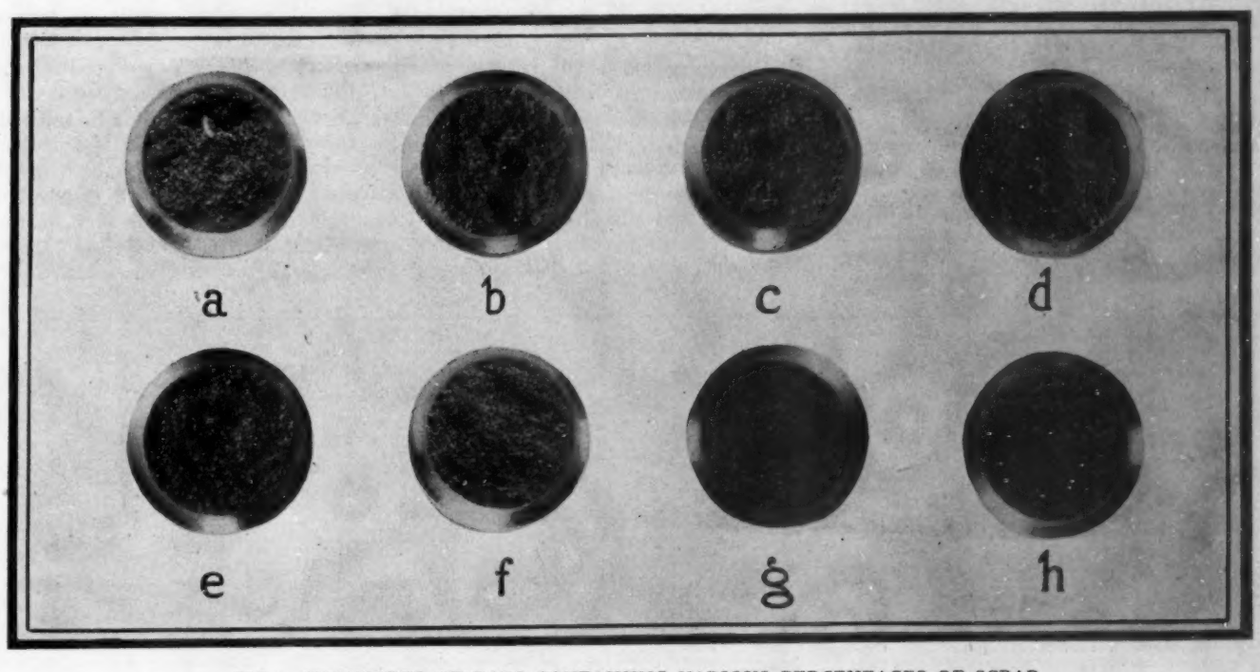


FIG 1—FRACTURES OF BARS CONTAINING VARIOUS PERCENTAGES OF SCRAP

(a) pure pig iron; (b) 20 per cent scrap; (c) 40 per cent scrap; (d) 50 per cent scrap; (e) 60 per cent scrap; (f) 80 per cent scrap; (g) 50 per cent scrap including 10 per cent steel; (h) 50 per cent scrap including 20 per cent steel

the iron going into the castings is determined by means of a test bar known as the arbitration bar. This is a bar 1¼ inches in diameter and 15 inches long. Two sets of two bars, it is specified, shall be cast from each heat, one set from the first and the other set from the last iron going into the casting. Each set of two bars is cast in a single mold. The bars are not rumbled or otherwise treated, being simply brushed off before testing. The transverse test is made on all bars cast, with supports 12 inches apart, the load being applied at the middle and the deflection at rupture noted. The minimum breaking strength of the arbitration bar under transverse load shall not be less than the following:

	Pounds.
Light castings	2,500
Medium castings	2,900
Heavy castings	3,300

In no case shall the deflection be less than 0.10-inch. The tensile strength of light castings shall not be less than 18,000 pounds per square inch; for medium castings it must be at least 21,000 pounds and for heavy castings at least 24,000 pounds per square inch. It is also specified that the castings shall be true to pattern, free from cracks, flaws or excessive shrinkage.

The following characteristics were determined for each melt:

1.—Transverse strength, average of four specimens.

2.—Tensile strength, average of four specimens.

3.—Scleroscope tests for hardness, four specimens.

4. — Micro-structure examination, three specimens.

5.—Examination of fracture, one specimen.

6.—Deflection at breaking, 12-inch centers, four specimens.

7.—Shrinkage in green sand, average of two bars; also average of two bars with ends of mold stopped off with cast iron blocks to obtain shrinkage against a chill.

8.—Castings of different weights of section were machined to determine whether they were suitable for commercial purposes and also to determine the polishing qualities.

9.—Chemical analysis, average sample from each melt.

Table I.
SUMMARY OF TESTS ON VANADIUM CASTINGS.

Test No.	Per cent scrap in mixture.	Transverse strength bar 1½ x 12-in. Tensile strength, lbs. per sq. in.	Breaking load on 12-in. centers.	Modulus of rupture, lbs. per sq. in.	Deflection. in.	Shrinkage, in. per ft. In green sand.	Against a chill.	Hardness shore scleroscope tool steel = 100.	Pouring Temperature, Fahr.
1	0	25,220	5,540	50,645	0.097	0.111	0.131	36.25	2,125
2	20	26,550	5,270	47,725	0.086	0.113	0.125	35.75	.....
3	40	22,080	5,740	50,220	0.098	0.108	0.127	36.75	2,475
4	50	23,345	5,900	53,465	0.116	0.117	0.138	36.40	2,145
5	60	25,840	5,140	54,990	0.104	0.126	0.148	36.10	2,240
6	80	24,500	6,130	54,695	0.114	0.120	0.148	35.50	2,250
7	*50	29,890	6,765	59,715	0.103	0.113	0.148	37.75	2,250
8	†50	30,515	5,720	56,680	0.071	0.235	0.240	46.75	.....

*Includes 10 per cent steel scrap. †Includes 20 per cent steel scrap.

It will be noted that the tests tend to show that the pig iron has unusual scrap carrying abilities. Prof. Fitch's report contains certain suggestions regarding the employment of this iron for ordinary foundry purposes, portions of which are as follows:

"In making recommendations for mixtures for castings, it must be remembered that a mixture of this iron with a different scrap would give results which could not be compared with certainty with the results obtained in the tests. Nevertheless the latter must give a good notion of what a foundryman can expect from this iron with scrap mixtures which are not very different from those used in the tests. Bearing this in mind, I would recommended a 50:50 per cent mixture for all work except heavy castings. A mixture of 20 per cent pig and 60 per cent gray iron machinery scrap will give good medium castings and will also be suitable for heavy castings. In addition, a mixture of 80 per cent gray iron machinery scrap and 20 per cent pig iron will satisfy the requirements for heavy castings. The 60 per cent mixture had an average hardness of 36.1 and the 80 per cent mixture a hardness of 35.5. In one melt 60 per cent pig iron was used with 20 per cent return scrap, 20 per cent foreign gray iron machinery scrap and 10 per cent scrap machinery steel. This mixture appeared to be satisfactory for all classes of castings. They were easy to machine, being of close grain and soft and they took a high polish which was easy to obtain. A large increase in the average for both transverse and tensile strength was obtained. This iron appeared to be particularly suitable for cylinders for internal combustion engines."

It will be noted that the tests indicate that there is nothing to be gained from using mixtures containing large proportions of pig iron, even for automobile cylinders or other work requiring a soft, dense, machinable metal.

Foundrymen are constantly devising methods of cheapening their mixtures without impairing the quality. Prof. Fitch's tests would indicate that this end may be obtained by selecting the proper grade of pig iron and melting it with scrap of known composition in a properly controlled cupola.

Liquid Fuel for Melting

The use of liquid fuel for supplying the heat necessary to melt metals or smelt ores is embraced in a patent recently granted to Dr. Bradley Stoughton, secretary of the American Institute of Mining Engineers. The process covered by the patent is designed especially for foundry cupolas and it already has been tried out in this respect with signal success, it is said. The first installation was made at the steel foundry of the Eagan-Rogers Steel & Iron Co., Crum Lynn, Pa., where the process has been

Table II.
ANALYSES OF MATERIALS.

	Pig iron, for all tests.	Scrap for Tests Nos. 1 to 6.	Scrap for Test No. 7, 10 per cent steel.	Scrap for Test No. 8, 20 per cent steel.
Silicon	2.00	1.74	1.69	1.13
Sulphur	0.02	0.09	0.07	0.06
Phosphorus	0.71	0.51	0.67	0.55
Manganese	0.69	0.36	0.49	0.38
Graphitic carbon	3.07	2.55	2.31	1.88
Combined carbon	0.55	0.75	0.38	0.37
Total carbon	3.62	3.30	2.69	2.25
Titanium	0.22	0.04	0.06	0.06
Vanadium	0.04	0.01	0.02	0.02

Table III.
ANALYSES OF MIXTURES.

	Test No. 1, pure pig iron.	Test No. 2, 20 per cent scrap.	Test No. 3, 40 per cent scrap.	Test No. 4, 50 per cent scrap.	Test No. 5, 60 per cent scrap.	Test No. 6, 80 per cent scrap.	Test No. 7, 10 per cent semi-steel.
Silicon	1.88	1.79	1.69	1.69	1.67	1.67	1.57
Sulphur	0.05	0.06	0.06	0.05	0.07	0.09	0.05
Phosphorus	0.72	0.71	0.62	0.68	0.62	0.62	0.66
Manganese	0.62	0.65	0.49	0.49	0.49	0.49	0.39
Graphitic carbon	3.03	3.03	2.85	2.83	2.65	2.66	2.58
Combined carbon	0.66	0.58	0.69	0.64	0.71	0.75	0.69
Total carbon	3.69	3.61	3.54	3.47	3.36	3.41	3.27
Titanium	0.16	0.16	0.12	0.91	0.09	0.06	0.19
Vanadium	0.04	0.04	0.02	0.02	0.02	0.01	0.02

FIG. 2—STRUCTURE OF BAR CONTAINING 40 PER CENT SCRAP

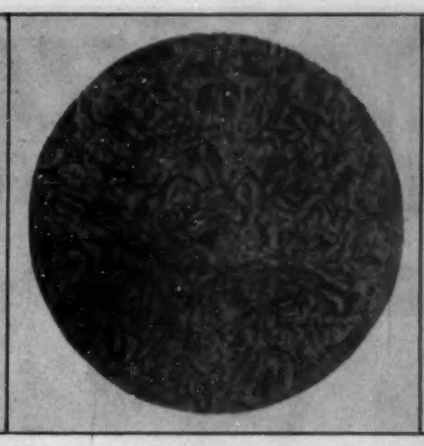


FIG. 3—STRUCTURE OF BAR CONTAINING 50 PER CENT SCRAP

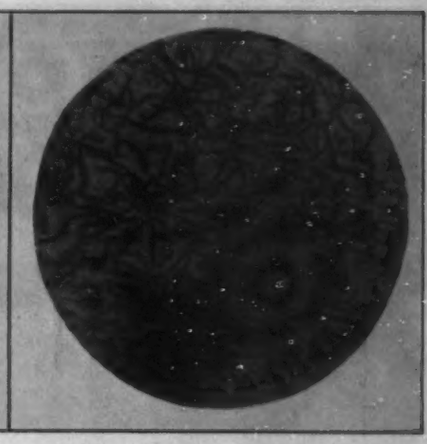


FIG. 4—STRUCTURE OF BAR CONTAINING 60 PER CENT SCRAP

adopted permanently. The cupola at this plant is equipped with four oil burners which are directed toward the center of the cupola at right angles to each other. Accompanying each of the burners is an air valve for supplying air for combustion.

The method involves the use of a certain amount of coke in the bed, and small quantities with succeeding charges. The cupola first is charged in the usual manner, the coke on the bed is then ignited and, after the coke has become incandescent, the oil flames are applied.

From an average of 245 pounds of coke per 1,000 pounds of metal, which formerly was the Eagan-Rogers company's practice, the coke consumption is said to have been reduced by the new process to 30 pounds per 1,000 pounds of metal. The oil consumption is one gallon to about 285 pounds of metal. In addition the use of this process is claimed to have increased the melting capacity of the cupola from seven to eight tons per hour, to 10 to 12 tons.

Dr. Stoughton has placed the process in the hands of Mulford Martin and Richard M. Jessup, bankers, 7 Wall street, New York, who are the sole licensees. The latter expect to launch the process on the market within a few months. In the meantime, further research work is being conducted with Dr. Richard Moldenke as consultant, to make the process thoroughly commercial.

Book Review

Resuscitation, by Charles A. Lauffer, medical director Westinghouse Electric & Mfg. Co.; second edition; 90 pages; cloth; published by John Wiley & Sons and furnished by *The Iron Trade Review* for 50 cents, net.

This pocket manual on resuscitation from electric shock, drowning or asphyxiation, by means of artificial respiration, using the prone pressure or Schaefer method, is a valuable contribution to the literature of the safety movement. It presents a lucid explanation of reasons for using prone pressure, with diagrams of the anatomical relations of the abdominal organs, the diaphragm and the lungs. The method has been applied in cases where the patient apparently was beyond aid, without a failure whenever used promptly. Commercial devices for artificial respiration are discussed. Instances of lives being saved are cited.

Aneroid Calorimeter and Specific Heat of Ice

There have recently been issued by the bureau of standards of the department of commerce two publications, Scientific Paper No. 247, entitled "An Aneroid Calorimeter" and Scientific Paper No. 248, entitled "The Specific Heat and the Heat of Fusion of Ice". In the former publication is described a calorimeter which has been developed by the bureau for measuring the specific heats of substances throughout a wide range of temperatures. The specific heats of substances are the amounts of heat required to heat unit weights of substances one degree in temperature, constants that are of great importance in engineering calculations. In the second publication above referred to this calorimeter has been applied to the accurate determination of the specific and latent heat of ice, that is the heat required to change the temperature of unit weights of ice one degree and to melt unit weight of ice, both constants of importance in the design of refrigerating machinery and in cold storage calculations.

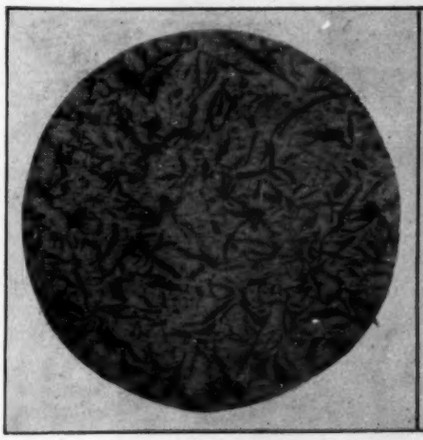


FIG. 5—STRUCTURE OF BAR CONTAINING 80 PER CENT SCRAP

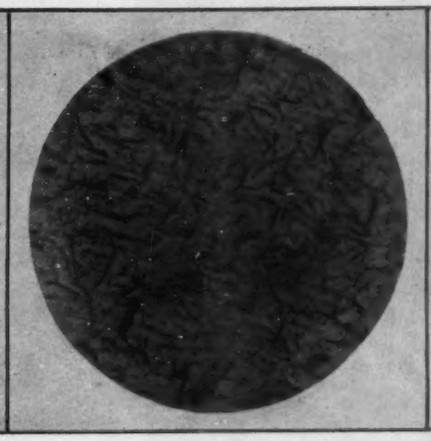


FIG. 6—STRUCTURE OF 10 PER CENT SEMI-STEEL BAR

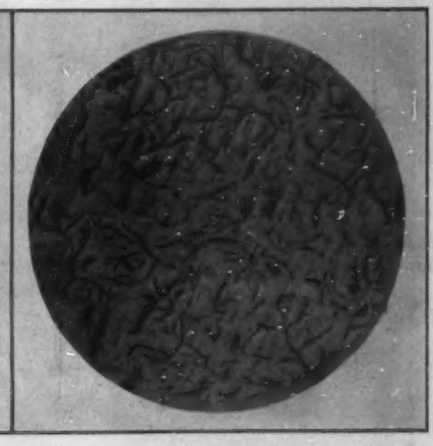
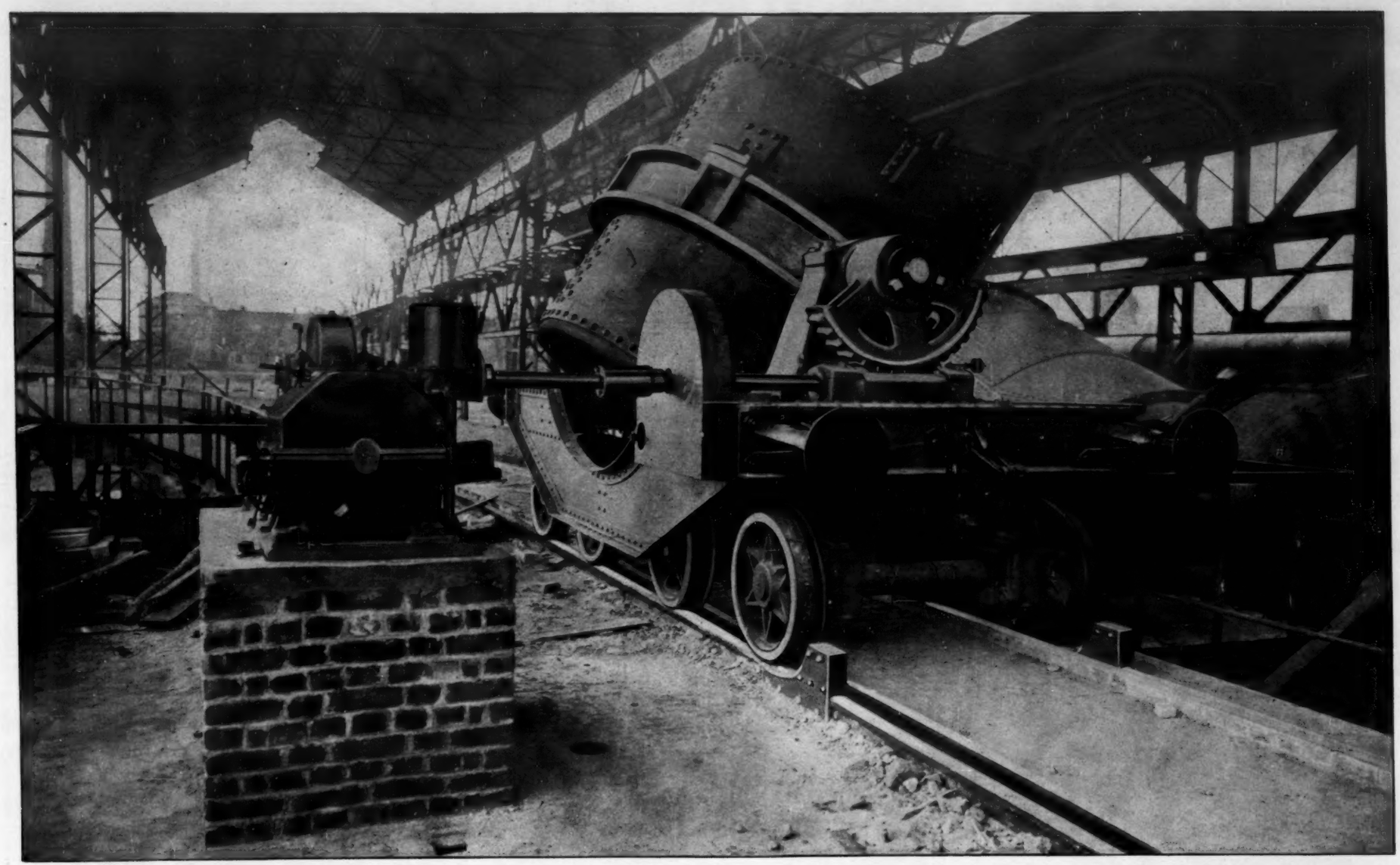


FIG. 7—STRUCTURE OF 20 PER CENT SEMI-STEEL BAR



GERMAN DEVICE FOR TILTING CAR LADLE WITH A STATIONARY MOTOR

The accompanying illustration shows the method of transporting molten iron from the blast furnaces to the bessemer converters at the plant of the Deutsche Maschinen Fabrik, Duisburg, Germany. The ladle has a capacity of 24 tons. It is emptied directly into the converter by power derived from the motor mounted on the brick pier at the left. The power is transmitted from the motor by a spiral gear to the worm shaft through a quick release coupling. The rails are fitted with blocks in order to stop the car at precisely the proper point. The ladle, also, is provided with hand-tilting apparatus. This arrangement has the advantage of requiring only one tilting motor for a number of ladle cars, thus reducing the investment in machinery

How to Make Good Steel Castings

Steel Foundrymen Face Many Difficulties Which May Be Overcome by the Application of Brains and Common Sense

BY JOHN HOWE HALL

THE STEEL foundryman has to guard against imperfections in his castings of several distinct types, which for greater convenience may be divided into the following classes:

1.—Pipes and other cavities due to contraction of the steel and formed chiefly during solidification.

2.—Stresses set up and cracks formed by contraction of the steel in the solid or semi-solid state.

3.—Internal blow-holes.

4.—Surface blow-holes, sand-holes and other exterior imperfections.

These imperfections must be prevented with the minimum loss of metal scrapped as sink heads, gates and runners. This paper is an attempt to set forth the principles that govern the methods commonly used to prevent the occurrence of these imperfections. Our metallurgists have not, up to the present time, studied these general principles so thoroughly as they have the proper methods to pursue in making steel of good quality; or, if they have done so they have not often published the results of their cogitations. There is, perhaps, a feeling among some of them that their proper sphere is the production of good fluid steel in the ladle and the heat treatment of the solidified castings, and that the production of sound castings is a simple matter that the molders should be able to attend to themselves. Since the phenomena of the contraction of steel in solidifying and cooling are far from simple, it is plain on a little reflection that the expert should pay attention to the molding and pouring, equally with the steel making and annealing. Indeed, the metallurgist who realizes, for instance, that some blow-holes are due to gassy steel and some to bad molding practice, and who is being held responsible by his superiors for all spongy castings on the score of "poor steel," is soon forced in self-defense to give his most careful attention to the subject.

Pipes and solidification cavities may be defined as cavities due to contraction of the steel and formed chiefly during solidification. It has not yet been definitely established whether steel actually expands or contracts at the moment of solidification. In a most careful exposition of the subject of piping in steel ingots, however, Prof. Henry M. Howe has shown that whether the steel contracts or expands in solidifying, the inevitable result of the comparatively rapid cooling of a mass of steel like an ingot is that the liquid metal in the interior fails to fill the first-frozen shell by progressively increasing amounts, and so sinks more and more as the ingot-walls thicken, producing the well-known "pipe."

One application of Professor Howe's methods of decreasing the depth of the pipe, which is utilized in ingot practice is to strip the ingots while their interior is still molten and charge them on end in the soaking pits, where their final solidification takes place slowly. The effect of this is that the metal solidifying upon the walls of the ingot has the greatest possible opportunity to slide down and fill the lower portion of the pipe, so that ingots handled in this manner do not pipe as deeply as when allowed to solidify in the molds.

In some cases it might be possible to accomplish a similar result by shaking out a casting before it is entirely solidified and charging it into a hot furnace where it is kept on end and allowed to complete its solidification slowly. By this method of handling, the metal in the sink heads would slide down to such an extent that the total amount of metal fed by a head of given size would be increased, so that a smaller head would be sufficient to do the work. The difficulty of so handling a casting, however, would in most cases prevent the use of this method. A modification of it, however, might be used for very large castings. Thus the heads and possibly a portion of the heavy upper parts of such a casting might be kept hot by removing the mold from around them and surrounding them with a brick-lined stove that could be put in position quickly and kept hot by means of oil burners or a coal fire. This method, indeed, is used to a certain extent when we heat the top of a sink-head with oil burners or a charcoal fire. Another way of accomplishing the same result is to use thermit in the heads in order to warm them up by the heat of the thermit reaction. Theoretically, the best way to fill a casting is from the top, straight down the sink-head, filling the top slowly. The heavier sections should be above the lighter, that the top may freeze last and feed the bottom: in some cases the bottom sections should be poured in chills, and there should be extra metal above the casting proper in the form of a sink-head, to feed the contraction of the upper portions. By such a method of pouring we should use all the available means for obtaining sound ingots. The stream of metal falling into the mold, however, would necessarily cut the sand so badly as to ruin the casting; or if cores intervened, they would be destroyed. Hence, we are compelled in the majority of cases to take the metal down a runner exterior to the casting itself, and into the casting by means of gates at or near the bottom. By dishing out the bottom of the runner and "nailing" the part so

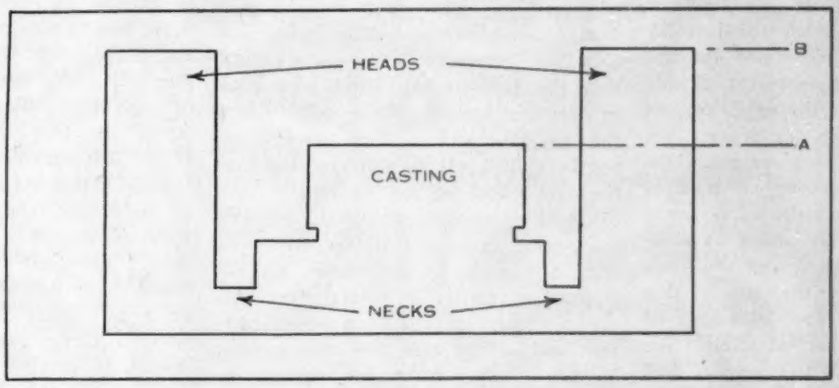


FIG. 1—HEADS IMPROPERLY PLACED ON A STEEL CASTING

Portions of a paper read at the Chicago meeting of the American Foundrymen's Association.

dished, we provide a basin whence the metal can enter the mold quietly and without cutting the sand, or spattering in such a way as to lead to surface imperfections.

Our molds, therefore, are commonly filled from the bottom, so that the metal which finally forms the top of the casting is that which first entered the mold and is the coldest. In most cases it is the only way to do the pouring. True, it is quite common to stop pouring through the gate when the metal reaches the sink-heads, and pour the latter from the top, and this practice is theoretically correct. But in some cases this is not sufficient, as the cooling of the upper part of a tall casting may outrun that of the bottom portions, poured last, to such an extent as to make it impossible for the feeding of the sink-heads to be effective. We may easily imagine a case where the top metal is so cold when pouring stops that it freezes completely, forming only its own small pipe. The sink-head will feed this; but the later-freezing lower portions will form their own contradiction-cavity, which is completely bridged off from the sink-head by the frozen upper portions.

This condition may often be met by arranging a series of gates at several levels, so that as soon as the mold and runner are filled up to the level of gate two (counting from the bottom) the metal will enter the mold through this gate and run in over that already in the mold. When the steel reaches the level of gate three, the process will be repeated. In this way we attain the advantages of top pouring, at least in part, by pouring in a series of sections; each section as it were acting as sink-head for the part below, and the sink-head proper feeding the last section poured. This is the first advantage of the use of gates at several levels. We shall again refer to the subject and mention the second advantage, in discussing the question of the size of gates and runners.

There are certain disadvantages of this method, which may in some cases prevent its use. The first is that any loose sand from the mold, which ordinarily floats upon the steel as the mold is filled, and hence is carried upward to the sink-head, where it can do no harm, may be trapped in the casting when the metal begins to flow in through the upper gates. The second is the danger of filling the runner too quickly, so that metal will flow through the second gate before the metal in the casting has reached that level, and cut out the mold as it flows down its walls. These disadvantages, however, will be discovered in many cases neither insurmountable nor prohibitive.

To return to the subject of chills from the standpoint of their first function, that of decreasing the size of shrinkage cavities. The laws laid down by Professor Howe show us that if we pour the bottom third of a casting, for instance, in heavy chills, we give to that third of the casting the maximum tendency to pipe,—since piping is the more pronounced the more the rate of cooling of the outer layers outstrips that of the inner during the first period of cooling, and heavy chills favor this condition. We thus cause the bottom third of the casting to pipe deeply, and since its cooling as a whole will be rapid, to pipe early. If this early and deep piping can be made to begin while metal is still being run in through the gate, that fresh metal will partly fill the cavity while pouring is still in progress; thus part, at least, of the object sought, the feeding of the casting, takes place during pouring.

In certain cases where the vertical height of the casting is small, compared to that of the runner, and no separate sink-head is used, the runner itself may be considerd as the sink-head. In this case, the action of properly placed chills may cause the feeding of the casting by the metal being run in to proceed so far that the metal in the runner will complete the work after pouring ceases and make a perfectly sound casting. The gates and chills, of course, must be so arranged that the later-poured metal may flow in over that already in the mold; hence the neighborhood of the gate must not be chilled. It is also essential that the first metal be run in rapidly, and the pouring completed slowly.

In some cases the runner will feed such a casting even without the assistance of chills; in others, the chills are necessary to produce a sound casting; and in any case, the casting must be low compared to the runner, so that there is no considerable portion of it above the gate. In theory, at least, such a casting, in order to be made sound by the metal in the runner alone, should be provided with a gate from top to bottom on one side, so that the feeding of all levels of the casting is by metal running in from above. Actually, of course, the gate need not be quite the full height of the casting.

Even when a sink-head is used in addition to the chills, so that we do not depend upon the runner to feed the casting after pouring ceases, this action of the chills is valuable, since it effects the feeding of the lower portions of the casting by the metal being run in through the gate. To take advantage of it to the full, the sink-head should be poured separately and from the top. Otherwise, we shall fill the head with the first-poured metal that has been cooled by the chills, and the head will tend to cool before the casting cools.

We spoke above of the fact that a high casting, poured through a single gate at the bottom, may freeze at or near the top to such an extent as to bridge off the sink-head from the lower part of the casting with the result that the piece will be unsound below. This, we saw, can be guarded against by the use of gates at several levels. The same end may be attained in certain cases by the use of chills on the lower parts of the casting, which so hasten the cooling of those portions as to cause them to freeze ahead of the upper parts. Manifestly, however, it will be advisable in many cases to use both these methods, since their effects are cumulative. Indeed, if the metal is all poured through a gate at the bottom, the effectiveness of the chills will inevitably be reduced by the chilling of the metal that first enters the mold and ultimately forms the top of the casting, which has to flow over the chills to a certain extent and consequently is not as hot as it should be when it reaches its final position. When, on the other hand, the metal enters at several levels successively the bottom of the casting is filled by the first metal entering the mold, and hot metal is run in on top of it through the upper gates; and in addition, the freezing of the lower portions is hastened by the chills. We thus get the full benefit of both the chills and the pouring in layers, so that as just stated their effects are cumulative.

This brings us to the consideration of the proper relative proportion of the sizes of gate and runner. The latter should obviously be large enough to carry the metal into the mold as fast as it is needed; therefore, it must be able to carry away the proper sized stream of metal as fast as it is poured from the ladle. Now if this is the case, and the gate or gates are of smaller cross-section than the runner, the latter will fill up with metal rapidly. The difference in level between the metal in the casting and that in the runner will then increase, putting more pressure upon the metal in the gate and increasing the velocity of its flow. This will be disadvantageous, first, because it will tend to cut out the sand of the mold, and second, because it will diminish the rate at which the casting as a whole is filled, and especially the rate at which the last metal enters the mold. For while the velocity of the entering stream will be increased as the runner fills up, so that at first the quantity of metal entering the mold will be maintained at nearly its proper amount; yet when the runner is full,

the velocity cannot be further increased, and will as a matter of fact fall, as the casting fills and the difference in level between the metal in the casting and that in the runner decreases. As a result, the metal toward the last will enter the casting very slowly, and the gate and lower part of the runner may even freeze. We see, therefore, that the area of the gates should equal that of the runner.

To put this somewhat differently, and perhaps more exactly, the average rate of flow is determined by the size of the gate and the average difference of level between the metal in runner and casting during the pouring of the mold. If the gate is so much smaller than the runner that the latter is full practically from the time pouring begins, the flow at first will be proportional to the height of the runner, and at the last will be zero,—the average flow being proportional, then, to half the height of the runner. If the gate and the runner are of the same size and capable of carrying the metal as fast as it is run in, the difference in level between the metal in the casting and that in the gate will be practically uniform throughout; since this level will be that which suffices to overcome the friction of the flowing metal against the sides of casting, gate and runner. As the metal grows cold in the casting and its fluidity decreases, this friction will increase, so that the difference in level will gradually increase. Thus the flow will be fairly uniform throughout, and a considerable decrease in the rate of pouring toward the last will be voluntary (as by decreasing the rate of pouring) rather than involuntary.

Thus the cross-section of the gate or gates should be equal to that of the runner,—in most cases there will be no object in making it greater. Should there be a number of gates, however, whose total cross-section is equal to that of the runner, they may be individually so small as to be in danger of freezing. In this event, their total cross-section may be made greater than that of the runner.

In filling a high casting through a single gate at the bottom, the metal that first enters the mold often becomes cold and semi-solid and by its friction against the side of the mold greatly retards the rate at which the metal rises in the mold. The more slowly the mold is filled, the more pronounced this retardation. Hence, we must use a gate and runner of large cross-section; for if they are small the mold will be filled so slowly that the metal first poured will become very much chilled before it has reached its final resting place. This chilling will greatly decrease the rate at which the metal flows into the casting, and the small gate and runner will be very apt to freeze shut. Hence, a high mold requires larger gates and runners than a low mold of the same cross-section, resulting in a greater loss of metal scrapped as sprues per pound of casting.

From what has already been said it is apparent that in the designing and locating of sink-heads, it is important so to place the casting in the mold and so to distribute the chills that the maximum amount of feeding will be done (1) during pouring, by the hot metal being run into the mold; (2) by the heavy sections of the casting which feed the light sections placed below, and (3) by the heads during the time when they are actually being filled (preferably from the top, so that they will be poured with fresh hot metal). In many cases it is impossible to take advantage of all of these methods. By careful arrangement, however, it is generally possible to utilize one or more of them, so that the heads have the least possible amount of feeding to do after the pouring is stopped.

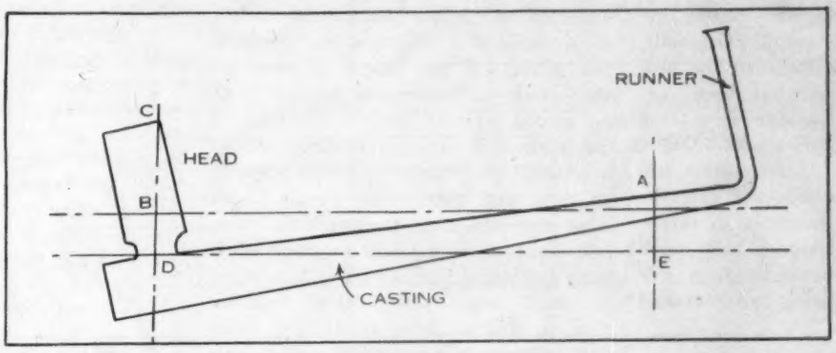


FIG. 2—HEAD IMPROPERLY PLACED AT LOWER END OF A CASTING

Thus in designing and placing heads we first consider how far we can take the work of feeding away from them and put it somewhere else. Then we consider the size of the head to be used, in view of the size of the section to be fed, and especially in view of the size of the neck through which the head is to feed.

In a great many cases, the thickness of the neck is fixed by that of the portion of the casting upon which the head is set. This being true, we are confronted with the law of fluid pressure. That law teaches us that if the diameter of the neck is small it is, from one point of view, quite useless to use a very wide head, because such a head exerts no more pressure upon the metal in the neck than would a head of equal height and of the same diameter as the neck. As far as exerting pressure upon the neck goes, only the height of the head is effective, and from this point of view the best head is one of diameter equal to that of the neck and of such a height that it shall contain enough metal to do all the feeding that will be needed.

But there is, of course, another side to this question, which is that a high and very narrow head would inevitably freeze to the center and cease to feed long before the cavity in the casting had been filled up, or to speak more accurately, before the cavity had ceased to form. We must, therefore, make the head of such a diameter that it shall not freeze to the center until after the necessity for its remaining molten ceases to exist,—in other words, the head must be at least as large, generally larger, than the section of casting it is to feed. It is quite useless, however, to provide a head of just the right proportions, if the neck freezes before the head has ceased to feed. Hence, the diameter of the neck must be great enough to prevent its freezing prematurely. The rate of cooling of a neck of a given diameter, moreover, is greatly influenced by its length and by the shape of the head.

We see, therefore, that when the diameter of the neck is fixed, as for instance by the width of the portion of the casting to which it is attached, the neck should be made as short as possible, and the head should be made with a square bottom and no wider than will suffice to keep its interior liquid and maintain the feed up to the moment when the neck freezes. All extra width beyond that necessary to accomplish this is so much plain waste of metal. The height of the head also should not be greater, for a given diameter of head and neck, than is necessary to provide enough metal to feed the casting completely. The head that has done its work to perfection would be hollow just down to the neck. Frequently we see heads 8, 10 and even 12 inches in diameter and 18 inches or 2 feet high, with necks only 2 inches wide and 3 or 4 inches high. Manifestly, such heads

have contained fluid metal and been capable of feeding the casting long after the neck, and even the casting itself, have solidified. The reservoir of liquid metal in the head is quite useless for the purpose for which it was provided, like a power dam with the flume to the turbine choked with mud, —the liquid we require to do our work is there, but it cannot flow to the place where we wish to use it.

Factors to be Considered

The factors governing the proper size of head and neck for a given casting vary to such an extent that it is practically impossible to do more than estimate roughly, by the light of previous experience, how large they should be made, and then allow an ample margin for safety. Having made a casting with a given size of head, it may prove unsound, that is, it may show a pipe under the neck when the head has been knocked, or cut, from the casting. In that case, the best means of remedying the trouble has to be considered. Again, the casting below the neck may be sound. Generally, it is assumed in that case that the proportioning of the head has been correct,—and so it has, as far as making a sound casting is concerned. Often, however, the margin of metal that has been provided is too great, so that the waste in sink-head scrap is excessive, and it will pay to consider how much the sink-head may be reduced in size without risk of making an unsound casting.

Making Necks in Cores

To make the necks small, in order that the heads may be knocked off by means of a sledge hammer or drop ball or burned off at the least expense, is dangerous practice because it may well lead to premature freezing of the neck. The result will be a pipe in the casting which will have to be plugged by means of the welder, the expense of the job often more than balancing the saving made in the cost of removing the head. Moreover, when the pipe is irregular and partly discontinuous the plugging often merely fills the top of the opening, like a cork in a bottle, and leaves the casting dangerously weak. Many a broken casting shows this defect in a striking manner. We may get our work accepted on a first order by indiscriminate plugging of holes, but if many of our castings break and show unsound places we will be pretty sure to find the customer has gone elsewhere for further orders.

By molding the neck in a special core it can be made very short, so that although considerably narrower in at least one dimension than the head, it will feed very efficiently. The core is so thin and the neck consequently so short, in this method of molding, that the mass of hot metal in head and casting quickly brings the core to a high temperature and thus keeps the neck fluid. The result is a very perfect feed with a neck comparatively narrow in one dimension. Moreover, by properly shaping the opening in the core the neck may be so formed that it can safely be broken from the casting, even though quite heavy. Care has to be exercised, however, not to knock off too heavy a neck or one that is not shaped just right (caused in some cases by the partial disintegration of the core), as the heavy shock of the blow brought upon a casting already full of shrinkage stresses may crack the casting. This question is considered in more detail in the discussion of "hot" and "cold" cracks in castings.

It is plain that as the metal in a head flows, or tends to flow, by gravity, the action of the head is most efficient downward. The extent to which a head will feed an opening that extends chiefly in a horizontal direction is evidently not great. Hence, when a considerable extent of horizontal surface is to be provided with heads, especially if the vertical dimensions of the castings are small, a number of heads must be used and they must be placed so close together that their effects overlap. Such a casting will be more efficiently fed by a number of comparatively small heads placed close together than by a few heavy heads. At times such castings are provided with a few very thick, but comparatively short, heads, evidently with the idea that by providing great total weight of metal in the heads the casting can be fed throughout. Of course only the height of the heads is useful in providing the pressure required to force the metal to flow sidewise to the distant portions of an opening, so that the total weight of the heads has nothing to do with their effectiveness in feeding far in a horizontal direction. Short, thick heads, therefore, will feed only a limited area near their bases, frequently an area that cannot use all the metal they contain. Hence much of their extra weight is plain loss. Were this extra metal distributed over the casting in a number of small heads, on the other hand, it would nearly all be utilized in feeding the shrinkage immediately below each head.

In case only a few heads can be molded upon a casting of this sort, so that each head must feed horizontally to a considerable distance, we should remember that the amount of metal to be fed may not be great, but the pressure required to force it to flow sidewise through an irregular opening may be considerable. In order to produce this pressure we need high heads. Increased height of heads to feed such a casting should in some cases be accompanied by decreased diameter, in order that there may not be too much waste of metal.

Use of Heavy Heads

Another error sometimes committed is to use heavy heads with thick necks, attached to the sides of castings near the bottom. The heads are made very heavy, evidently with the idea that their total weight can be utilized in forcing the metal they contain up into the casting to feed the shrinkage of the latter. If they fail to feed as expected, heavier, but seldom higher ones, are tried.

Of course, when our laws of fluid pressure are again applied, the effective pressure exerted upon the neck of the casting shown in Fig. 1 by the metal in the heads, is proportional only to the difference in level A-B between the metal in the head and that in the casting, so that after pouring is stopped only the portion A-B of the head is effective in producing pressure on the metal in the neck to make the latter flow. Increased diameter of head will not increase this pressure in the slightest—though by keeping the metal hot longer, it prolongs the period during which the pressure is exerted. Increased height of head, on the other hand, greatly increases the pressure.

Heads Under Disadvantage

Moreover, the heads, so attached, are laboring under the disadvantage that they do not feed their fluid metal, directly downward into the top of the gradually deepening pipe, but have to do their work by bringing pressure to bear on the still liquid metal in the casting, by which that metal is made to flow upward and close the pipe, as it does when a solidifying ingot is compressed at the bottom. Working in this manner, the heads must fail to be effective as soon as the metal in the casting becomes too sticky to flow; and they cannot, however long they stay fluid, feed the portion of the pipe that forms after the metal of the casting has become solid. A head placed on top of the casting, on the other hand, continues to feed the pipe so long as the head and neck remain fluid, and it feeds chiefly by direct flow, not by forcing the metal in the casting to move upward. Hence, it feeds efficiently at all stages of the formation of the pipe. Heads placed in the manner shown in Fig. 1 must inevitably be seriously inefficient, and in a great many cases might as well be omitted altogether as so attached. It is observed that thin castings, especially long, narrow, shallow sections, are frequently tipped

up at the gate end for pouring. The most obvious reason for doing this is that it assists the pouring by making the metal run down-hill, instead of along on the level, and so enables us to "run" a piece that we might not be able to fill in any other way. A further advantage of this method, however, is that it to some extent substitutes top pouring, and downward feeding by the heads along the length of the casting, for bottom pouring. The more we tip the casting up, the greater this advantage—indeed, whenever possible, we pour the thing "on end," so that when it is filled each section may feed that immediately below it, and a comparatively light head on top will suffice to give us a sound casting; while if we poured "on the flat," we might need several heads distributed along the casting.

In some cases such a casting can be made sound by the action of chills placed upon the lower end, without the use of sink heads. The metal running in through the gate does much of the feeding while the casting is being poured, and the metal in the runner suffices to feed the final shrinkage that takes place after pouring ceases. In case the effect of the chills will not suffice to make the casting sound, heads are necessary. These are frequently placed toward the lower end of the casting, especially if that end is the heavier. So located, the heads are not in a position to feed as efficiently as they should. In Fig. 2, for instance, we see that if the runner will suffice to feed the casting as far along as *A*, then the rest of the metal in the casting, from *A* to *D*, will tend to run downward toward *D*, and will exert a fluid pressure proportional to *A-E*, the difference in level between *A* and *D*. The portion of the head *B-D*, equal to *A-E*, is useful only to balance this pressure, and only the portion of the head *B-C* exerts pressure upon the metal in the casting. Moreover, the conditions are much like those in the case of the side-attached head already discussed—we are trying to make the head close a pipe which will form in the upper portion of the casting, between *A* and *D*, by forcing the metal below to flow back against gravity and close a distant opening. A second head between *D* and *A* might or might not be so located as to be just over the place where the pipe tends to form, since the position of this pipe will vary from casting to casting, depending upon the temperature of the metal when poured, how fast it is being poured, etc.

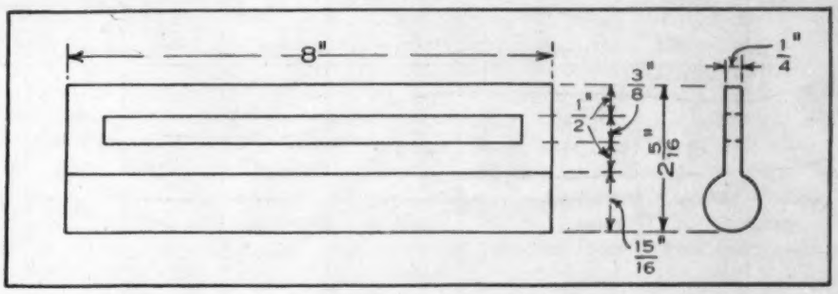


FIG. 3—SHRINKAGE TEST BAR

If for any reason it is essential to place the head on such a casting at the lower end, the head should be made as high as possible and should be poured separately with hot metal from a second ladle. If the head is filled with the metal run in through the gate, the metal in the head will be cold when pouring ceases, more especially if chills are used on the heavy portion to counteract to some extent the tendency to freeze at the top first; and as we have seen, the heads should, whenever possible, be filled with hot metal. If there is nothing to prevent it, the casting should be tipped up and gated at the heavy end, in order to conform to the rule that the top should be the last portion to freeze and the head should be on the upper end, for the same reason. Chills, if used at all, should be on the lower end, but if the lower end is much the lighter they may not be needed.

Cracks in castings are due primarily to the shrinkage of the steel in cooling from the temperature of solidification to that of their surroundings. The shrinkage of ordinary carbon steel amounts to about 1/4-inch per foot, being somewhat less as the carbon approaches 0.90 per cent, and greater the lower the carbon. Could all parts of the casting cool at the same rate, shrinkage would not make trouble. But when a light portion cools ahead of a heavy one, the resultant shrinkage of the light section often brings a heavy pull on the heavy one when the latter is still hot and weak, resulting in the tearing apart of the two at the weakest place—which is not necessarily the smallest section, but that which is weakest at the temperature existing when the stress is set up. Should the casting hold together, the later shrinkage of the heavy portion after the light part has become cold and rigid often sets up heavy compression stresses in the latter. Thus in the shrinkage stress test bar shown in Fig. 3, the light section cools first, the hotter heavy part yielding to the pressure. Then when the heavy portion begins to cool faster than the light part, the latter is compressed very strongly, so much so that if it is cut in two with a hack saw when cold, the moving together of the sides of the cut can be measured very easily. The magnitude of the stress set up is very great;—so great that a blow with a hand hammer on the heavy part, and not a very heavy blow at that, suffices to snap the connecting leg between the light and heavy portions as if it were a pipe stem.

Cracks are favored by: High sulphur in the steel, causing red-shortness; low carbon, which gives the maximum shrinkage; unevenness of sections, causing variations in the rate of cooling; sharp corners in angles of castings, especially where a thick section joins a thin one; use of tie-bars stronger than the casting; and resistance of mold and cores to shrinkage of casting.

We are obliged to make our castings either of a definitely specified carbon content, or of a low enough content to make the castings tough when annealed, and easily machined. We cannot, therefore, alter the carbon content to decrease the shrinkage. The sulphur content depends upon the raw material and the steel making process we use. Basic open-hearth steel can be kept quite low in sulphur, basic electric furnace steel even more so, without very great expense. Acid open hearth, bessemer and acid electric furnace steel frequently run rather high in sulphur, so that the foundryman who uses them is obliged to exercise more care in guarding against cracks than the user of basic steel. The effect of high sulphur content is to make the steel weak and brittle when hot (red-short), so that it more readily tears apart under shrinkage stresses.

Tie-bars are extra pieces of metal used to bridge across from one part of a casting to another, and serve to prevent the shrinkage from warping the casting out of shape. When they are made too strong they may serve their true purpose so well as to overdo it. For if the shrinkage stresses which they resist should become so great that something must go, obviously the weakest part will be the victim. Hence, the tie-bar often has to be so designed that it will be sure to fail before the other portions of the casting; and in some cases it is notched to insure that it and not the casting itself shall give way under the stress, should the latter be great enough to break something.

Many castings are so shaped that the resistance of cores or portions of the mold to the shrinkage of the steel will result in the cracking of the work unless the sand is thoroughly loosened up as

(*Continued on page 242b.*)

New Method of Making Sieve Tests

How Samples of Iron Ore Are Taken at Mesabi Range Stockpiles for Testing Purposes

BY ROBERT H. BASSETT

AN ACCURATE and reliable stockpile sample for sieve test purposes is difficult to secure during the winter months, owing to the freezing of surface of stockpiles. The Great Northern Iron Ore Properties formerly used the following method.

A small scoop-full of ore was taken from the ends of each stockpile car. The daily sample, gathered in this manner, was quartered down and a portion saved until the end of the month, when a sieve test was made of the samples representing the production for the month. The samplers were instructed to take samples with a very small scoop, from the same point in each car. Owing to rapid hoisting and consequent lack of time, it is probable that this order was not followed out to the letter when the foreman was not around, especially when chunks of ore happened to lodge at the point where the sample was to be taken. Monthly sieve tests made of these samples showed about 15 per cent of the ore passed through a 100-mesh sieve.

Some of these tests were made at properties formerly operated by the Oliver Iron Mining Co., and inquiry showed that this company had experienced no particular trouble with the structure of most of these ores. As the present operators were not satisfied with these tests, the following method was put in use at the Leonard No. 2 stockpile as soon as the frost had left the surface and work could be carried on with safety.

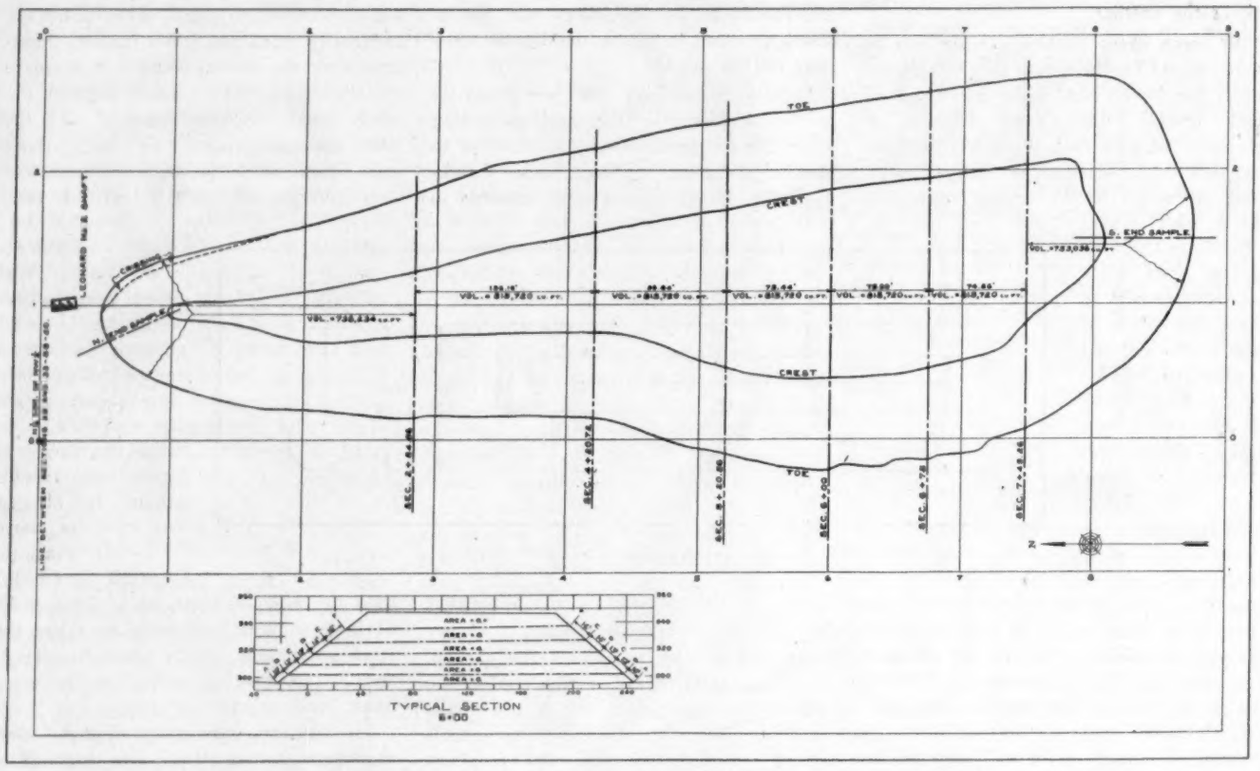
Adopt Tentative Method

Transverse lines were staked out across the stockpile with equidistant spaces between. A rope, marked at each foot, was stretched along these lines on each slope of the pile. The sampler was instructed to take a sample at each footmark, beginning at the bottom of the pile with a full scoop. The amount of sample taken at each point was decreased as progress was made toward the top of the pile, in proportion to the relative widths of the top and bottom of the pile. For instance, if the pile was twice as wide at the bottom as at the top, a full scoop of ore would be taken at the bottom and only a half scoop-full at the top.

This method was incorrect as the stockpile was wedge-shaped and the volume of ore between the parallel lines staked out across the stockpile, varied considerably. In addition, the accuracy of the sample depended greatly on the judgment of the sampler in determining the fractional part of the scoop to be taken at the top of the pile, assuming a full scoop was taken at the bottom. After a careful consideration of these inaccuracies, a new method was devised and is now used at all of the Great Northern Iron Ore Properties' stockpiles, in making sieve tests for guarantee purposes.

The accompanying illustration shows this method as followed at the Leonard No. 2 shaft stockpile in May, 1915. Cross sections of the stockpile at 20-foot intervals were taken to determine correctly the shape of the pile, the total

(*Continued on page* 242b.)



METHOD EMPLOYED AT LEONARD NO. 2 SHAFT IN TAKING SAMPLES

The author, Robert H. Bassett, is chief engineer, Great Northern Iron Ore Properties, Chisholm, Minn.

News of Employers and Employes

Important Decisions Affecting Labor—Conditions in New England Industries

THE United States bureau of labor statistics has just issued its annual review of court decisions affecting labor as its Bulletin No. 169. Approximately 265 decisions are summarized, dealing with the application and construction of the laws, or with the application of the principles of the common law to the rights and relations of the worker.

Decisions of outstanding importance which are reviewed in this bulletin include the final opinions of the appellate and supreme courts of the United States in the famous Danbury hatters' case, holding members of unions personally liable for damage from boycotts; the dissolution of the famous injunction in the case of John Mitchell against the Hitchman Coal & Coke Co., of West Virginia, and holding labor unions legal; and the supreme court's opinion in the Coppage case, overthrowing the law of Kansas which undertook to protect workmen in their membership in labor organizations. In the last named case the dissenting opinion, which defended the constitutionality of the act, is also given.

The largest group of cases on a single subject is that relating to the new form of legislation known as workmen's compensation laws. The decisions on this subject range from questions of constitutionality, decided adversely in the case of the Kentucky statute and favorably in other state courts, to the determination of definitions or of single points of dispute. In considering occupational diseases, for instance, the Massachusetts courts hold lead poisoning to be within the state act, providing for compensation for "personal injuries arising out of and in the course of employment", while the Michigan courts, under the provisions of a state law similarly expressed, hold that a case of lead poisoning is not entitled to compensation. An optic neuritis induced by inhaling poisonous gases was also compensated in Massachusetts, while in New Jersey the court disallowed a claim on account of eczema said to be caused by acids used in a bleachery. Other decisions relate to the mode of computing benefits, the definition of the term "casual employment", what constitutes dependency, wilful act, incapacity, etc. Taken in connection with an earlier bulletin on the same general subject, the bureau of labor statistics has here presented one of the most complete collections of cases on American compensation laws in existence.

Another important group of decisions in a related field is of those determining the application of the federal liability statute to different classes of railroad employments. Several cases are found which turn on the nature of the employment of the injured person, i. e., whether in interstate commerce or not. The courts are not uniform in their construction of this statute, but among the employments found to be within the act were those of a blacksmith repairing cars used in interstate commerce, a telegraph lineman engaged in repair work, workmen installing block signal systems, a carpenter building an addition to a freight shed, a laborer carrying coal to heat a shop in which interstate cars were being repaired, etc. Employments, which according to the decisions were excluded, were workmen constructing cut-offs for shortening interstate trackage, a hostler killed by the explosion of the boiler of a locomotive whose last run was intrastate, and a switch engine fireman who was at the moment handling only intrastate cars, though his work regularly involved the handling of both classes of commerce indiscriminately.

Law Upheld

New York, July 20.—Constitutionality of the New York state workmen's compensation law has been upheld by the court of appeals against the attack of the Southern Pacific Railroad Co., which alleged that the law operated to deprive owners of property without due process of law. The railroad was contesting damages in cases of injury and death awarded by the lower courts. Judge Miller in the opinion says:

"No one has a vested right under the constitution to the maintenance of the common law doctrine that the master is responsible for the acts of his servants, which doctrine undoubtedly may be extended or curtailed by the legislature. No one doubts that the doctrine of assumption of risk and the fellow servant doctrine, also developed by the courts under different conditions than those now prevailing, may be limited or entirely abrogated by the legislature.

"It would not be a great extension of that doctrine for the legislature to provide that the employe should assume the risk of all accidental injuries, and if that can be done, it is certainly competent for the legislature to provide for the creation of an insurance fund for a limited compensation to the employe for all accidental injuries, regardless of whether there was a cause of action for them at common law."

Labor Conditions in New England

The board of directors of the Winchester Repeating Arms Co., New Haven, Conn., has approved establishment of an employes' pension system, which went into effect last Wednesday, applying to about 12,000 persons. Under the provisions of the plan an employe who has worked for the company 30 years may be retired at his own request at the age of 55 years and a woman who has worked for 30 years for the company may retire at 50 years at her own request. The company in its discretion may retire and put on the pension fund any male employes 60 years old who had worked for the company 25 years, or any woman of 55 years who had been employed by the company for a like period. No pension is to be for less than $20 a month, but the amount generally is to be based upon the employe's annual average paid during the five years immediately preceding retirement.

The E. W. Bliss Co., of Brooklyn, has issued the following announcement:

"In view of the unusual conditions in the business of the company, the management has decided to inaugurate, beginning Aug. 1, a 48-hour week with the same pay as for the present working week."

This action of the company likely will forestall possible action of the machinists' union, some of whose national officers recently stated publicly they intended to seek a reduction in working time of Bliss company employes as well as increased pay. The Bliss company is working on large war orders.

P. J. Conlon, vice president of the machinists' union, has arrived at Lynn, Mass., and appears especially interested in the operations of the local plant of the General Electric

Co. At a meeting of the Lynn union, Mr. Conlon is quoted as having said an attempt will be made to seeking an increase in wages of $1 a day and a working day of eight hours, demands identical to those presented at Bridgeport. The Lynn works are said to be making munitions for European belligerents.

Machinists employed at the Washington navy yard have taken up with President Wilson a disagreement with the Secretary of the Navy Daniels over a wage readjustment and have asked the President to have their pay increased.

The Wright Wire Co. has closed down its mill at Palmer, Mass., for an indefinite period as the result of a strike of workmen who demanded more pay and a readjustment of working hours. President G. W. Wright had asked for a further conference, July 26, before the men called a strike. He declared that the company could not increase wages at this time and was quoted as saying that if a strike were called the Palmer mill would close and the company would secure supplies of wire for its Worcester mills from other sources. Labor union heads asserted the strike was started irregularly and advised the men to return to work; but the strikers did not do so and the order to close the mill followed.

Homes for Employes

The Indian Hill Co., Worcester, Mass., composed of officers of the Norton Co., and Norton Grinding Co., has awarded the contract for the construction of 24 houses to cost about $60,000 and which are expected to be ready for occupancy Dec. 1. They will be built on Indian hill, which the company is laying out as a community settlement for the employes of the two companies. The houses will cost $2,800, $3,000 and $3,500 each, and the purchaser will have to pay down 10 per cent in cash and the remainder in monthly installments. The houses will not all be of the same type of construction.

Courses for Employes

Iron manufacturers who are members of the Tennessee Manufacturers' Association are much interested in the plan for university extension courses for plant employes, which has been developed through the cooperation of the University of Tennessee. Wherever classes of 20 men can be formed, the university will send faculty representatives to deliver lectures and direct courses of study, while 144 commercial moving picture films, owned by the university will also be used in the same work. The idea is to give men at the lathe and bench an opportunity to progress. J. E. Annis, president of the Chattanooga Roofing & Foundry Co., attended a recent conference on the subject in Knoxville.

Working Night and Day

Milwaukee, July 27.—A continuance of excellent bookings, which obliged the Vilter Mfg. Co., ice and refrigerating machinery, corliss engines, etc., to work a night force some time ago, has resulted in the addition of new men, all skilled laborers, and Theodore Vilter, president of the company, is in the most optimistic frame of mind in more than two years' time. Said Mr. Vilter to the representative of *The Iron Trade Review*:

"We are pleased to be able to report that we are still continuing to operate our shops night and day, sometimes with a few more men and once in a while with a few less men. The business is of a substantial nature and is keeping up nicely."

The Vilter company is filling orders for refrigerating machinery for shipment to many foreign countries, excepting those engaged in the war, and at this time has an exceptional lot of bookings from South America and Australia.

Building Presses

The Mesta Machine Co., Pittsburgh, is building a complete line of hydraulic and steam-hydraulic presses for piercing, drawing and forging. At the present time, 15 such presses are going through the company's plant. The company is also making accumulators of various sizes for use in connection with hydraulic systems. Among the accumulators being built is one exceptionally large in size and capacity. It is 32 inches in diameter with a 25-foot stroke and will deliver water at a pressure of 2,500 pounds per square inch. The plant is well equipped for doing this work and is in a position to make very quick deliveries.

The large new plant of the Nixon Nitration Works at New Brunswick, N. J., recently organized to manufacture explosives, will be surrounded by a non-climbable chain link fence 8 feet high, for which the contract has been awarded to the J. W. Fiske Iron Works, New York.

The Detroit Starter Co., Detroit, manufacturer of gasoline starters, has increased its capital from $20,000 to $150,000.

Larger Force

Will be Put to Work by Commonwealth Steel Co. at Granite City

St. Louis, July 27.—The Commonwealth Steel Co., Granite City, Ill., has announced that it would increase its working force by 850 men on Aug. 9, employing its old men as far as possible. Large orders for box car frames from one of the western roads is said to be the cause of the increase in force.

The American Car & Foundry Co., Madison, Ill., has appropriated a large sum of money for improvement of its plant, and is placing additional men at work to handle a large order for box cars for the Russian government.

Officials of the National Enameling & Stamping Co., Granite City, have announced that an appropriation of $100,000 has been made for the purpose of establishing a jobbing department in connection with the Granite City rolling mill.

Spain, as yet neutral, has let a contract for cartridges that will keep the Western Cartridge Co., at East Alton, busy a year, according to announcement made officially by officers of the company. Almost simultaneously it became known that the Wagner Electric Co., of St. Louis, has been making shrapnel parts for France.

Waldo A. Layman, president of the Wagner Electric Co., confirmed the report that his company, at 6400 Plymouth avenue, had been working on a shrapnel order from the French government. He said the order was "comparatively small".

He denied the report current recently that his company was working on a $3,000,000 shrapnel contract.

"The order we had," he said, "was for a number of the mechanical devices which cause the explosion of shrapnel shell, but we have completed that contract."

Purchase Plant.—The Cisco Machine Tool Co., Cincinnati, O., has purchased the Von Wyck Machine Tool Co., of that city, manufacturer of machine tools. The Cisco company is planning a number of improvements, both in building and equipment. Officers of the company are: H. C. Busch, president; James I. Stephenson, vice president; James A. Sebastiani, secretary and treasurer; G. Mil. Horton, general manager.

A limited company has been formed to collect the scrap iron in the districts of Russian Poland occupied by the Germans. The scrap is to be used in the Silesian iron works.

Money and Iron: Fact and Comment

Some War Stocks Soar to New High Records—Republic Iron and Steel Shows Nice Increase in Earnings

THE most interesting feature of the stock market during the past week was the effort of Horace S. Wilkinson, of the Crucible Steel Co., to check the wild speculation in the stock of that company. He pointed out that the company has war orders aggregating about $15,000,000, or about one-tenth of the amount reported in daily newspapers. He said it would be possible to make $5,000,000 or $6,000,000 profits on these orders if everything goes all right. The bulls found some satisfaction in this statement, but Mr. Wilkinson also called attention to the fact that while year before last the company made profits of almost $5,000,000, it made only about $1,000,000 last year. He added: "This year, the company will make not to exceed $2,500,000, it requiring $1,750,000 to pay preferred dividends. There is outstanding in unpaid scrip and back dividends $7,200,000. The company is guaranteeing $7,800,000 of bonds in addition to $2,500,000 to $3,000,000 bonds outstanding on subsidiaries. The common stock is in the hands of the public, which is evidently intending to hand it to others at the highest price at which it can be sold." Mr. Wilkinson's action has been heartily commended by representatives of industrial concerns whose stocks have been boomed unjustifiably on account of receipt of war orders. It is generally recognized that such unnatural inflation as has recently taken place is bound to cause disaster, not only to the companies directly interested, but to many other industries and perhaps to business in general.

In spite of Mr. Wilkinson's efforts and of some events which should have had a steadying influence, war stocks closed Saturday at the top prices of the week. Buying of Bethlehem Steel by Wall street professionals was a very prominent feature, but the public manifested a disposition to stay out of the market. Bethlehem's new high record was 209½. A report that the American Can Co. had taken a new $40,000,000 order from the British government resulted in the stock of that company making a new record, as did also Baldwin Locomotive. On the curb market, Electric Boat stock rose 97 points to a new record of 362. The preferred of this company advanced 70 points to 325. Earlier in the week, there was some anxiety in connection with the President's note to the Kaiser, but when that document was made public, it had little, if any, effect on the situation.

Baltimore & Ohio gained strength on account of its fine showing made in its preliminary annual report, which indicates that the company has converted a large loss of gross earnings into a very comfortable gain in net profits.

Quotations at the close of business July 24 and changes in the leading stocks identified with the iron and steel industries for the week are shown in the following table:

	Close July 24.	Net chge.
Amer. Brake Shoe & Fdy. Co. ctfs.	103	—3
Amer. Brake Shoe & Fdy. Co., ctfs., prfd.	163⅞	+1⅞
American Can	59⅛	+7⅛
American Can, prfd.	105	— ⅛
Amer. Car & Fdy. Co.	56¼	—1¾
Amer. Car & Fdy. Co., prfd.	....	.....
American Locomotive	53½	+2⅜
American Locomotive, prfd.	95⅞	.....
American Steel Foundries	39½	—2½
Baldwin Locomotive	78⅜	+4⅞
Baldwin Locomotive, prfd.	103¾	+1¼
Bethlehem Steel	208	+20⅞
Bethlehem Steel, prfd.	125	+5
Colorado Fuel & Iron	34¼	— ⅝
Continental Can	67	— ½
Continental Can, prfd.	100	+ ⅛
Crucible Steel	45½	—2¼
Crucible Steel, prfd.	96¼	—3½
General Electric	170	+3
International Harv. of N. J.	96	.....
Inter. Harv. Corp.	62	.....
Inter. Harv. Corp., prfd.	99½	+ ½
Nat'l. Enamel'g & Stamp. Co.	23⅜	+4¾
Nat'l Enamel'g & Stamp. Co., prfd.	89½	+7¼
Pressed Steel Car	50	— ½
Pressed Steel Car, prfd.	99⅞	+ ⅛
Pullman Palace Car	162	+6
Republic Iron & Steel Co.	35¼	+1⅜
Republic Iron & St'l Co., prf.	92⅞	+2⅛
U. S. Cast Iron Pipe & Fdy.	15	—1
U. S. C. I. Pipe & Fdy., prfd.	35⅝	—5⅛
United States Steel	64¼	— ⅜
United States Steel, prfd.	110⅞	— ⅛
Westinghouse Mfg.	107⅜	+3⅞

Dominion Steel Shows Decrease

The report of the Dominion Steel Corporation, Ltd., Sidney, N. S., for the year ended March 31, discloses a decrease of $870,974 in net earnings. However, a surplus of $225,256 is shown, contrasting with a deficit of $86,105 in 1914. This is due to a sharp reduction in the amount of dividend payments. Comparative figures follow:

	1915.	1914.	Decrease.
Net earnings.	$3,571,058	$4,442,032	$870,974
Ch. and dep..	2,715,802	2,587,206	*128,596
Net	$855,256	$1,854,626	$999,570
Dividends	630,000	1,940,931	1,310,931
Surplus	$225,256	†$86,105	$311,361

*Increase. †Deficit.

The balance sheet shows current assets in excess of current liabilities amounting to $4,273,000, against $3,700,000 at the close of the previous year.

The Dominion Steel Corporation controls the Dominion Iron & Steel Co. and the Dominion Coal, Ltd. It also owns the entire common stock of the Cumberland Railway & Coal Co.

Large Increase in Earnings

Net earnings applicable for dividends of the Republic Iron & Steel Co. were 62 per cent in excess of the earnings for the corresponding period last year, according to the semi-annual financial statement submitted by the executive committee. After deducting depreciation and all other charges net profits applicable for dividends of $1,007,503 remained, equal to 4.31 per cent on the $25,000,000 preferred stock for the six months, or at the yearly rate of 7 per cent on the preferred and 1 per cent on the common. Prices of products sold during the period averaged approximately 7 per cent on the preferred and 1 per cent on the common. Prices of products sold during the period averaged approximately 7 per cent lower than last year. The increase in profits was due to some increase in tonnage, but more largely from improvements and economy and efficiency in manufacturing, labor rates for the period not having been reduced. The balance of net quick assets as of June 30, 1915, now stand at $12,474,362. The income account for the first half compares as follows:

	1915.	1914.
Net earn. from op.	‡$1,771,697	$1,316,731
Int. and div. fr. invest.	28,357	5,100
Total prof.	$1,800,053	$1,321,831
Deprec., etc.	263,839	178,882
Exhst. of min.	101,128	109,285
Total deduc.	$364,966	$288,167
Net profits	1,435,087	1,033,664
Interest	427,583	414,888
Surplus	*$1,007,504	$618,776
Pref. divs.	.....	875,000
Surplus	$1,007,504	†$256,224
Prev. surp.	6,615,290	6,512,778
P. & L. sur.	$7,622,793	$6,256,553

*Equal to 4.31 per cent on $25,000,000 preferred stock for the six months, or at yearly rate of 7 per cent on preferred, and 1 per cent on the common.

†Deficit.

‡After deducting charges for maintenance

and repairs, amounting to $673,495 for 1915, and $742,100 for 1914.

The report says in part:

"The principal addition to the manufacturing facilities since the date the last annual report has been the installation of a plant for the recovery of benzol from by-product coke gas, which plant was completed and placed in operation during June. There have been added also numerous minor improvements for economic reasons. At present there is under construction extensions to the by-product coke works which will increase the output of by-product coke as well as other by-products approximately 100 per cent.

"The cost of these improvements has been largely financed by sales of bonds, although $1,000,000 of the proceeds of such sales were used for the retirement of a like amount of collateral notes which matured June 2, 1915, the balance of these notes having been renewed for one year. The prospects for the iron and steel business is decidedly better, the current volume of business being close to the works capacity, with prices strong and tending upward."

Receiver Appointed

The Universal Swing Joint Co., of Louisville, has been put in the hands of a receiver on motion of the bondholders, represented by the receiver of the Commercial Bank & Trust Co., of Louisville. The circuit court appointed John H. Hile receiver, and he will manage the property until further notice. The concern manufactures flexible steam joints. The plant was formerly operated by the Kentucky Gear & Machine Co., which disposed of the property to the present company.

Financial Notes

The Cambria Steel Co. has declared the regular quarterly dividend of 1¼ per cent, payable in cash Aug. 14 to stockholders of record July 31. The last quarterly cash dividend was declared in this period last year. Three quarterly dividends have since been paid in script, bearing interest at 5 per cent per annum and maturing in two years from the date of issue.

The regular quarterly dividend of 1¾ per cent on the outstanding preferred stock of the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., for the three months ending June 30, 1915, has been declared, payable to holders of record at the closing of the books at 3 p. m., July 24, 1915. The preferred stock books will remain closed until 9 a. m. Aug. 2.

Tube Mills

And Other Additions to be Made by Republic Company

The Republic Iron & Steel Co., which has made great progress in recent years, has announced that further important additions will be made to its plants at Youngstown.

The improvements include building two open-hearth furnaces in addition to the 10 now operating, and two tube mills in addition to the four now at Lansingville. It is understood one new mill will be a lap weld and the other a butt weld. Ground had been broken for the foundations of the open hearth furnaces and this with the tube mill improvements will be carried rapidly to completion. Contract was let for the installation of Taylor mechanical stokers at the Brown-Bonnell plant. A 2,400-kilowatt alternating current generator will be installed at the Haselton plant to provide power for the additional mills. The Raymond Concrete Pile Co., of Youngstown, has been given contract for the foundations for the open hearth furnaces, and the McClintic-Marshall Co. will build the extension to the open hearth plant. The output of the new benzol plant recently put into operation also will be doubled practically, and additions will be made to the present battery of Koppers by-product coke ovens. The original benzol plant has an output of about 2,600 gallons daily. A department for making conduit also will be installed. The two open hearth furnaces will increase the works capacity about 20 per cent. while the tube department will be extended 50 per cent by the new furnaces.

No; Thanks

Toledo, O., July 27.—The largest war order which has as yet been offered in Toledo, was recently tendered the McNaull Boiler Mfg. Co., and was rejected by the concern which gave as its reason that the plant is too busy at present with regular patrons to accept a large outside order.

A Fine Guide Book

This year, when there is unusual interest in travel in the United States, has been selected by the United States Geological Survey as the time to publish a series of guide books covering four of the older railroad routes west of the Mississippi. One devoted to the Overland route, with a side trip to Yellowstone Park, has just been issued. It is a volume of 244 pages, elaborately illustrated with 29 maps and many halftone engravings showing places of interest, explaining geological features and giving much information of interest, especially to travelers contemplating a trip to the Pacific coast this year. The route book is sold by the superintendent of documents, Washington, D. C., at $1 per copy.

Gratified

By Decision of Commission in Regard to Trap Cars

Pittsburgh, July 27.—Steel interests are gratified over the decision handed down last week by the interstate commerce commission, ordering railroads to cancel tariffs proposing charges for a trap car service. The commission found the rates were not justified. It was proposed to assess these charges against industries in territory lying east of the Mississippi river and north of the Ohio and Potomac rivers with the exception of New England. It also included that part west of the Mississippi river and west of the Rocky Mountains, including southwest territory. The commission said that if the tariffs were permitted to become effective, inequalities and discriminations in existing tariffs would be increased and new discriminations of like character would be multiplied. The commission also pointed out that, "by co-operation carriers and shippers have made a trap car an efficient and important instrument for the expansion of both transportation and commercial business of the country. It is not desirable that anything should seriously impair its efficiency."

The term "trap" or "ferry", strictly speaking, is applied to a car placed at an industry or commercial house, having a private siding, there loaded by a shipper with less-than-carload shipments, and hauled by a carrier to its local freight or transfer station for handling and forwarding of contents.

Various charges were proposed in the tariffs, ranging from 2 cents per 100 pounds with a minimum of $2 per car up to 4 cents per 100 pounds with a minimum of $4 per car.

One large steel company said that if these tariffs had been allowed to become effective, the cost to it would have been $30,000 a year.

Commissioner Harlan dessented from the opinion of the majority and insisted that trap car service is performed free. He said that the majority report concedes the propriety of a charge for the so-called trap car service in its most typical form. There is at present a trap car charge, carrying a minimum of $2 a car. The tariffs, just ordered canceled, however, would in many cases involve a cost of $10 a car.

Compromise

May be Agreed Upon as to Rate for Hauling Slag

Pittsburgh, July 27.—Some prominent traffic managers of steel companies in this district think that railroads will voluntarily reduce rates for hauling slag from blast furnaces and steel works in western Pennsylvania, Ohio and West Virginia. They base their belief on the fact that railroad representatives told shippers at a meeting at the Pittsburgh chamber of commerce last week that a compromise proposed by the furnace and steel interests would be taken up, with higher railroad officials for consideration.

President James A. Campbell, of the Youngstown Sheet & Tube Co., Youngstown, made a vigorous talk for the furnace owners and told the railroad representatives that shippers would be willing to pay 10 cents a ton with a maximum of $4 a car for hauling slag and to continue paying 25 cents a ton on mixed weights. The proposed charge on the latter is 35 cents a ton. Mr. Campbell said that if the rates in effect in Ohio and western Pennsylvania are not reduced, it will be almost impossible for shippers to start idle blast furnaces. He asserted it would increase the cost of production of pig iron from 15 to 20 cents a ton. Another meeting will be held in Pittsburgh in about a week, when railroads are expected to announce whether they will accept the proposed compromise. In the event they do not, shippers will protect tariffs before the state commissions.

The interstate slag and refuse tariff becomes effective tomorrow. It proposes a charge of 20 cents a ton for hauling slag and 35 cents a ton for hauling refuse, and is intended to meet suggestions made by the interstate commerce commission in its recent decision.

One of the principal changes in this tariff as compared with the old and irregular schedule is embodied in the following paragraph:

"These carriers will accept slag loaded into cars on private sidings of industries connected therewith or on team tracks for wasting for the plant at some convenient point on their lines, at a charge of 20 cents per net ton." Other important changes in the new tariff is the naming of destinations to which slag is to be hauled. Shippers also hope that this interstate slag rate will be reduced.

The railroads are protesting before the public service commission of West Virginia that that body exceeded its authority when it suspended the slag tariffs before it. It is maintained by the railroads that these tariffs had actually been in effect 24 hours before they were suspended.

Directors of the Brier Hill Steel Co., Youngstown, O., have authorized construction of an additional open hearth furnace, to increase the present capacity of the plant one-seventh. The proposed addition will be of 75-ton capacity and will bring the company's production of open hearth steel up to 1,000 tons a day.

Very Busy Shops

Milwaukee, July 27.—The Allis-Chalmers Mfg. Co., Milwaukee, is now operating practically every department of its main shops at West Allis on full time for the first time in more than a year. The pattern shops have been working a night shift for several weeks and this will mean extra operations in the producing departments in a short time. The principal work in some departments for three or four months has been the machining of shrapnel shells for the Bethlehem Steel Co., but recent bookings of heavy machinery have called forth operations in the normal line of business which are most encouraging in every way. At this time eight large pumping engine contracts are going through, three being for the city of Cleveland, O., and five for the city of Chicago's drainage system.

Used Car Tanks.—The Universal Iron & Supply Co., St. Louis, has issued a circular, giving a list of used tank car tanks made of boiler plate steel, which it has for sale. Each tank before shipment is thoroughly overhauled, tested and painted.

The Abramsen Engineering Co., Pittsburgh, designers of rolling mill equipment, has moved from 1914 to 810 Union Bank building.

The Hamilton Machine Tool Co., Hamilton, O., has closed for immediate shipment of $15,000 worth of lathes to France.

SERIOUS PROBLEMS OF THE OLD RANGES

Third of a Series of Short Talks on Iron Mining

BY P. B. McDONALD

The three Michigan iron ranges, or "old ranges," have undergone a long, steady development as compared to the sudden rising of the overshadowing Mesabi. The mines have not the tremendous proportions of the Mesabi properties, but may well be of more lasting interest to the visiting mining man, being deeper and more varied. Owing to the ore bodies occurring in every possible shape, size and position, and to the ore varying in hardness and physical qualities, the economical extraction of it in large tonnages presents extraordinary and endless problems, often changing in different parts of the same mine and at different stages of development in bewildering fashion.

A mining captain's job at a Michigan iron mine is no sinecure, neither is it any cinch. It is no wonder that the captain insists that he is more important than the surface boss or the master mechanic, and feels that he should be elected supervisor of his township, in addition to giving all his relatives a job at the mine. The staff at a Michigan iron mine must be capable and able men, or their faults will be heard from in the caving of a pump-room or in a quicksand catastrophe; and it is usually good policy for a company to give free rein to the mining captain's choice of men, even though he favors his relatives somewhat. Some companies promote their mining captains to be managers of all their iron ore mines, and seldom lose by doing so, as this insures due attention being given to the underground and practical work, where after all most of the money is spent.

Furthermore the mining captain understands the miners and local conditions. At the same time, it is well to have a good engineer or an educated, broad-gauged man near the top of the staff for supplying ability for new explorations over a wide field, and to counteract the mining captain's perhaps too conservative views. A few companies make a practice of promoting their cashiers or chief clerks to managers and superintendents of the mines, which is all right if the man isn't too much of the bookkeeping temperament addicted to "penny saved, pound lost" ideas.

No Limit to Inquiries for Tools

Eastern Concern Closes for More Than $300,000 Worth of Machinery—

Several Big Steel Plants in Eastern Ohio Will Be Enlarged

THE demand for machine tools for making war munitions now is again showing unprecedented activity. There seems to be no limit to the volume of inquiries both from domestic concerns and from abroad. As previously has been the case, a good many of the current inquiries cannot be closed due to the scarcity of the tools wanted. An exceedingly large volume of business, however, was transacted during the week just closed. One of the largest transactions involved the sale of machine tools aggregating more than $300,000 in value to an eastern concern, which just has decided to go into the manufacture of high explosive shells. A great many other concerns are figuring tentatively on shrapnel or high explosive shell contracts. Among these are the Pennsylvania Steel Co. and the Pittsburgh Valve, Foundry & Construction Co., which are inquiring for large quantities of machine tools. A good many other concerns are inquiring in a smaller way. For instance, the Reeves-Cubberley Engine Co., Trenton, N. J., wants 20 to 25 turret lathes for use in turning out shrapnel shells. One of the most interesting developments is the report that the Baldwin Locomotive Works has secured another contract involving approximately $60,000,000 worth of shells. Despite the fact that this report appears to be well-founded, the Baldwin company is understood not to be inquiring for any additional machinery at this time. Among good-sized war buyers last week were the International Steam Pump Co. and the Crocker-Wheeler Co., both of which added to the equipment which they had previously purchased for making shells. The New York Air Brake Co. also has bought some additional equipment.

Foreign buyers are extending their purchases more and more to machine tools other than lathes, screw machines, etc. Big orders for all kinds of tools have been entered to such an extent that one of the largest machinery concerns in the United States is sold up to October and November on shapers and planers, until October on slotters, from six weeks to three months ahead on all kinds of drills, etc. In only a very few cases can deliveries on 14 to 16-inch engine lathes be had before November; small screw machines are sold ahead to October and November, automatic screw machines in many cases until next February, and turret lathes in nearly all cases until February. It is impossible to place orders for complete rifle-making equipments for delivery prior to next February. The demand from abroad is spreading out on a large scale to machinery other than machine tools. The Browning Co., Cleveland, has taken an order for 42 locomotive cranes for shipment to France. The Brown Hoisting Machinery Co., Cleveland, has an order for 38 locomotive cranes for Russia. Another concern has just received a big Russian order for drawbridge machinery. A great deal of business involving miscellaneous machinery for export, is pending and should be placed in the near future.

The domestic demand for machine tools in the east again shows some improvement, but it is conceded generally that this domestic business is far from normal. No new railroad inquiries of any importance have come out. Nothing further is heard in regard to the Seaboard Air Line list, which aroused considerable enthusiasm when it came out recently, and the opinion is gaining ground among machinery houses that no orders will be placed by this road for some time to come.

A crane inquiry of considerable interest has appeared from Wm. Cramp Ship & Engine Building Co., Philadelphia; it involves four 10-ton cranes with a span of 150 feet. Among the concerns in the east that are expanding their capacity are the Wasson Piston Ring Co., Hoboken, N. J., which is building a branch at New Brunswick, N. J.; the Stephens Nut & Bolt Co., Pawtucket, R. I.; the Electrical Engineering & Storage Battery Co., Sandy Hook, Conn.; the Wyman & Gordon Co., Worcester, Mass.; the Eynon-Evans Mfg. Co., Philadelphia; the Shawingan Electro Products Co., Baltimore; Taft-Peirce Mfg. Co., Woonsocket, R. I.; Blanchard Machine Co., Cambridge, Mass.; New Process Steel Co., Lancaster, Pa.; Carpenter Steel Co., Reading, Pa.; Heppenstall Forge & Knife Co., Bridgeport, Conn., and many others.

Steel Plants Will Be Enlarged

Machine tool dealers in the Pittsburgh district are watching industrial developments in eastern Ohio, where owners of several large manufacturing concerns have completed plans to increase capacity to a considerable extent. Thomas J. Bray, president, the Republic Iron & Steel Co., has announced that his concern will build two additional open hearth steel furnaces and two new tube mills, which together with other improvements, will cost approximately $1,000,000. Some of the contracts already have been awarded. The Youngstown Sheet & Tube Co. is carrying out its plans to install a bar mill department, having awarded contracts for buildings to the McClintic-Marshall Co., Pittsburgh. The Trumbull Steel Co., Warren, O., as previously reported, plans to increase its capital stock from $2,500,000 to $4,000,000 to provide additional sheet mill capacity. The Valley Mold & Iron Co., Sharpsville, Pa., is considering the advisability of extending its plant, and it is understood an industrial interest has been obtaining options on property adjacent to that of the Andrews & Hitchcock Iron Co., at Hubbard, O. The McKeesport Tin Plate Co., McKeesport, Pa., has awarded contracts for 20 hot mills, 28 inches in diameter, and 14 cold mills, 26 inches in diameter, to the United Engineering & Foundry Co., Pittsburgh; the contract includes the cold mill drive and necessary squaring, doubling and bar shears. The Jones & Laughlin Steel Co. will furnish 2,500 tons of fabricated steel for the new buildings. The Ford Motor Co., which plans to double the capacity of its assembling plant at Pittsburgh, will enter the market shortly for a large number of tools. General domestic demand for all types of machinery, is described as active and inquiries for equipment for the manufacture of war material are more numerous than a week ago.

Glad to Get Second-Hand Tools

The only limit on the volume of business which could be done by machine tool dealers in the Chicago district is their ability to obtain various types of lathes

COLUMBIA STEEL CO.
ELYRIA, OHIO

The Columbia Steel Company has to have a Perfect Floor

¶ Conditions in this mill are exceptionally hard on floors. Those heavy trucks carrying three and four tons of steel are constantly being moved about. The efficiency of the mill, the proper control of costs, depend very largely upon the facility with which such trucking can be done—with a minimum of floor maintenance expense.

¶ An examination and test of many flooring systems decided these manufacturers to put down an

Ayer & Lord
Interior Wood Block Floor

¶ After two years' service under tests as thorough and severe as any that can be imagined, the Vice-President wrote: "We unhesitatingly recommend a wood block floor made of Ayer & Lord Blocks."

¶ The Columbia Steel Company found that weight has not disturbed the level of this floor—it has suffered no appreciable wear. Use has only compressed, ironed out the wood fibre to a more perfect smoothness, while it retains all its resiliency. This floor has proved comparatively noiseless—does not originate dust—is a non-conductor of heat and cold—resists fire—is always easy on the feet.

¶ A wood block floor to measure up to this record must have Ayer & Lord quality in it—the quality due to careful selection of timber and perfect method of creosoting. Ayer & Lord Blocks are made only of long-leaf yellow pine because the extreme density of the wood fibre gives the greatest strength and resistance to end compression. Each block is thoroughly impregnated with pure creosote oil, which preserves it from decay indefinitely.

¶ Whatever the nature of your flooring problems—you should investigate the possibilities of Ayer & Lord Interior Wood Block Floors. Their marvelous adaptability has been demonstrated in hundreds of instances.

NOTE TRACKING OF TRUCK WHEELS OVER FLOOR. THIS SHOWS HOW THE BLOCKS BECOME IRONED OUT BY USE AND WELDED INTO A DENSE, SMOOTH UNIFORM MASS.

Write us for new booklet "FLOORS" It contains further information — photographs of installations of every character. Tell us something of your problems—our Engineering Department will gladly advise and specify to suit your conditions without any obligation being incurred.

Ayer & Lord
Wood Block Floors
Carry the heaviest loads—
Stand the hardest wear—
Resist fire and heat—
Don't swell or buckle—
Don't damage tools—
Are dustless, noiseless, dry and sanitary—
Easy on the feet.

Ayer & Lord Tie Co.
General Office: Railway Exchange, Chicago

CLEVELAND, OHIO
926 Illuminating Building
KANSAS CITY, MO.
1117 Rialto Building
MEMPHIS, TENN.
142 Exchange Building
PHILADELPHIA, PA
319 Perry Building

AYER & LORD TIE CO. INCORPORATED — AYER & LORD INTERIOR WOOD BLOCKS — Always Easy on the Feet — RAILWAY EXCHANGE, CHICAGO

and screw machines available for manufacturing war munitions. At many times in past months it has seemed that all the second-hand machines of these types which could be ferreted out had been brought to the front and disposed of. Just when the supply seemed to have been exhausted, in some way not understood by dealers a further supply has appeared. Dealers who took a chance on the demand lasting for several months and kept placing additional orders with manufacturers are reaping the benefit of their foresight in being able to dispose of the machines at a handsome profit.

European buyers, finding it almost impossible to fill their needs with new machinery, are now willing to take second-hand lathes and a large shipment was made this week by a Chicago dealer. Another price increase of 10 per cent, making 35 per cent in the past year, has been announced by Cincinnati builders and probably other manufacturers will follow their example.

Apparently a number of large contracts for war material have been placed with manufacturers in and near Chicago. These contracts are said to be ironclad and to cover from two to three years regardless of the war. This has stimulated the local demand for suitable machinery to supplement that already in use in these plants and a number of unusually large deals are now pending and probably will be closed within the next fortnight.

A nameless company, which already has bought nearly $800,000 worth of machinery, is still buying and has a deal on now for about $40,000 worth of machines of one type as well as other prospective purchases from other dealers. This concern maintains its secrecy remarkably well; all its buying is being done through one man, who takes charge of the machinery and attends to its delivery without the seller knowing where it goes. Those who scoffed at the existence of this concern when rumors first appeared are now convinced of its actual existence, but no one has been able to pierce the secrecy which surrounds it.

Machine tool builders in other cities in this section, especially in Milwaukee and its suburbs, are operating their plants at full time and in many cases with night shifts. The demand is not entirely dependent on war material, as domestic requirements are increasing somewhat, but are not as large as would be the case were prices and deliveries more attractive.

Wage Increases in Cincinnati

Eugene C. Pociey, French consul at Cincinnati, in connection with M. Manton, of France, is endeavoring to place $45,000 worth of lathes with Cincinnati manufacturers, but no one can guarantee the deliveries wanted. The Hamilton Machine Tool Co., Hamilton, O., has closed with Mr. Manton for $15,000 worth of lathes for immediate delivery. The Lodge & Shipley Machine Tool Co., the American Tool Works Co., the R. K. LeBlond Machine Tool Co., and the Cincinnati Milling Machine Co. have granted their employes an advance of 10 per cent in wages during the present rush season, the reason being that each man has been asked to do his best to maintain production and therefore will be given a share in the profits of the companies. The machinery situation is unchanged. All lathe manufacturers are busy with full order books, and other plants are busy making parts for lathes. Milling machines and radial drills have also been selling well. It is said that no shrapnel is being made in Cincinnati.

EASTERN STATES

MANCHESTER, N. H.—W. H. McElwain Co. has started work on a $150,000 power plant addition, of 1,600 horsepower, in South Manchester.

ATHOL, MASS. — Athol Mfg. Co. has been incorporated; $200,000 capital stock; by L. S. Starrett, president and J. D. S. Everett, treasurer. The company will occupy the factory of the old Millers River Mfg. Co., idle for three years and owned by Mr. Starrett. New machinery has been ordered and more will be installed.

BOSTON.—Flintkote Mfg. Co. has leased the second floor of the building at 348-352 Congress street for a term of years.

BOSTON. — Edison Electric Illuminating Co. has made a long term lease of the three buildings at 490-512 Atlantic avenue, to the Joseph B. Manning Co., for occupancy about Jan. 1, 1916.

QUINCY, MASS.—Fore River Ship Building Corp. has let contract for its proposed 2-story, 135 x 779-foot addition.

WESTFIELD, MASS. — Pope Mfg. Co.'s plant in Westfield has been purchased, at the receiver's sale, by H. P. Coursens, representing Wilbur C. Walker, Hartford, Conn., and Scott McLanahan, New York. The sale included all the real estate, factory buildings, equipment, cash on hand with the receivers and the liabilities of the receivers incurred in the operation of the plant. It is understood a new company will be formed to operate the plant.

WORCESTER, MASS.—B. R. Phillips Mfg. Co., Boston, a new concern with capital of $400,000, which has taken over the plants of the Critchley Machine Screw Co. and the Reed & Curtis plant in Worcester, is endeavoring to acquire property in the vicinity of these plants to erect additional buildings. The Phillips company will manufacture war munitions.

WORCESTER, MASS.—C. A. C. Lubricants Co., just organized in Massachusetts, with capital of $100,000, will establish a plant in Worcester for the manufacture of lubricants. Andre Jamellier, 443 North Main street, Springfield, Mass., is interested.

BRIDGEPORT, CONN.—Heppenstall Forge & Knife Co. has been granted a permit to erect an addition to its steel forge shop on Howard street.

HARTFORD, CONN.—Abbott Steel Ball Co., Elmwood, Conn., has let a contract for a 2-story, 25 x 72-foot addition.

HARTFORD, CONN.——Hartford Machine Co. has let a contract for a four and 6-story and basement, 47 x 206-foot factory and office building.

SANDY HOOK, CONN.—Electrical Engineering & Storage Battery Co. will establish a plant in Sandy Hook in the buildings formerly occupied by the New York Belting & Packing Co., and will make electric motors, etc.

WATERBURY, CONN.—Noera Mfg. Co. is taking bids on a 1-story, 56 x 85-foot addition.

WATERBURY, CONN. — W. E. Griggs, architect, has about completed plans for a 1-story, 50 x 70-foot addition to be erected by the Pilling Brass Co..

PAWTUCKET, R. I.—Stephens Nut & Bolt Co. has purchased the old Star Tanning Co.'s building, Central Falls, R. I., and will equip it with modern machinery for manufacturing nuts, bolts and screws. It is said war orders are responsible for the expansion.

WOONSOCKET, R. I. — Taft-Peirce Mfg. Co., in addition to having let a contract for a 5-story and basement, 50 x 120-foot, storage building, has started work on a 4-story, 32 x 140-foot, and 1-story, 30 x 50-foot machine shop. This company is inquiring for considerable new equipment for the new buildings.

ALBANY, N. Y.—Peter J. Callan, 13 North Pearl street, is taking bids on a 4-story, 35 x 70-foot factory to be erected at 396 Broadway.

BROOKLYN.—L. S. E. Co., machines, engines for sewing, knitting, etc., has been incorporated; $150,000 capital stock; by H. K. Milliken, J. Hampden Dougherty and R. G. McCann Jr., 51 Leonard street, Brooklyn.

ELMIRA, N. Y.—Elmira Commercial Motor Car Co. has been incorporated; $500,000 capital stock; by Henry Bush, Albert Von Beaulieb, and George Gebbie.

NEW YORK. — T. A. C. Corporation, motors, engines, machines, supplies, has been incorporated; $150,000 capital stock; by Emil Frankel, Winchester; S. Clark and Joseph M. Stoughton, Yonkers, N. Y.

ROCHESTER, N. Y.—Vacuum Oil Co. has let contract for a 3-story and basement factory.

ROME, N. Y.—Electric Rod Mill, wire rods, insulator wire, castings, etc., has been incorporated; $5,000 capital stock; Clarence R. Keeney, Frank M. Hotter Jr. and Herbert T. Dyett, Rome.

SCHENECTADY, N. Y.—Board of contract and supplies, this city, is considering bids on a 10-ton hand power crane.

UTICA, N. Y.—Bossert Mfg. Co. has let contract for 2-story, 34 x 80-foot addition to nickel plating and polishing room.

EDDYSTONE, PA.—Bids are being taken for a transformer house to be erected here for the Baldwin Locomotive Works.

ERIE, PA.—Mutual Telephone Co. has increased capital stock from $500,000 to $1,000,000.

FRANKLIN, PA.—Colburn Machine Tool

SITUATED 25 minutes from the center of Chicago, fully equipped and possessing ideal shipping facilities, the sale of this modernly equipped drop forge plant offers at this time a particularly attractive investment. The plant, consisting of 3 main buildings and smaller structures, is in first-class condition and ready for immediate work on heavy or light drop forgings. Has been largely used in past on automobile work.

Simple installations will quickly adapt this plant to profitable work on **shrapnel** and **high explosive** shells.

WAR ORDER CAPACITY

Without change or addition, this plant can be immediately employed for the production of shrapnel and high explosive shell discs, bayonet forgings and army harness forgings.

Unexpected events oblige a quick sale of this plant. Prompt attention will be given inquiries from reliable sources. Specification details and photographs are ready for mailing if a personal call is not yet desired.

FOR IMMEDIATE SALE

A Drop Forge plant, complete and fully prepared for large and small work. Fully sprinklered.

Can be quickly adapted to co-operative work on shrapnel and high explosive shells.

LOCATION—25 minutes from the center of Chicago with excellent shipping facilities. Plant and yard cover 5 acres.

Memorandum

For further information on sale of drop forge plant located near Chicago, write to

R. H. Crowell, Attorney

804 New England Building **Cleveland, Ohio**

Co. has about completed plans for a 1-story, 20 x 100-foot addition.

FRANKLIN, PA.—French Creek Foundry Co. will build a 1-story, 70 x 150-foot structure to replace that recently burned.

HARRISBURG, PA. — Pennsylvania Steel Co. is figuring on taking a shrapnel contract and is inquiring on the necessary machine tool equipment.

HOMESTEAD, PA.—Homestead Valve Mfg. Co. has increased its capital stock from $50,000 to $75,000.

JOHNSTOWN, PA.—Borough of Westmont will receive bids until Aug. 16 for the erection and construction of a proposed municipal building, plans for which are at the office of H. M. Rogers, 710 Johnstown Trust Co. building; Harry P. Shomo, 206 Greene street, Westmont, Johnstown, is secretary of the borough.

LANCASTER, PA.—New Process Steel Co. has let contract for two additions, each one story and 40 x 86 and 40 x 98 feet, respectively.

NEW KENSINGTON, PA.—United States Aluminum Co. has started the erection of a $200,000 building, which will be used for a warehouse and mill offices.

PHILADELPHIA.—Wm. Cramp & Sons Ship & Engine Building Co. is in the market for four electric traveling cranes, each having capacity of 10 tons, and 150-foot span.

PHILADELPHIA.—Bids are being taken for a 3-story foundry and machine shop, 50 x 120 feet, with a wing, 58 x 120 feet, to be erected by the Eynon-Evans Mfg. Co., Fifteenth and Clearfield streets.

PHILADELPHIA. — Baldwin Locomotive Works is understood to have booked an additional contract for shrapnel, involving about $60,000,000. As far as known, however, this concern is not inquiring for any machinery additional to that bought a few months ago for making shells.

PITTSBURGH.—Central Tube Co. has increased capital stock from $650,500 to $655,500.

PITTSBURGH.—Duquesne Light Co. has increased its capital stock $1,000,000.

PITTSBURGH.—Pittsburgh Valve, Foundry & Construction Co. is in the market for a large quantity of equipment to make shrapnel.

PITTSBURGH.—Union Storage Co. has purchased property on Smallman street and will erect a $500,000, 8-story, produce and cold storage warehouse. J. L. Porter is president and C. L. Criss, secretary-treasurer.

ELIZABETH, N. J.—Galena-Signal Oil Co. has purchased property of Atlantic Reduction Co. in Elizabeth. This makes the third purchase of property by the Galena-Signal Oil Co. here within the past two months. The company as yet has not announced its plans.

NEWARK, N. J.—Aetna Realty Co. has purchased a 75 x 100-foot lot on Goble street for the erection of a 4-story factory building.

BALTIMORE.—Baltimore & Ohio railroad is considering the erection of a coal loading plant at Curtis Bay, Md.

CENTRAL STATES

AKRON, O.—Akron Motor Cart Co. has been incorporated; $20,000 capital stock; by W. H., W. J. and E. W. Boardman, S. A. and W. F. O'Neil.

AKRON, O.—Plans for a viaduct from the downtown section to North Hill will be completed this summer and the proposition will be voted on at the fall elections. Walkins Engineering Co., Cleveland, is estimating the damage to property owners.

BELLEVUE, O.—The county commissioners have sold $15,000 bonds for the construction of several bridges. William Schepflin, county surveyor, will prepare plans for the proposed bridge to be built by Seneca and Sandusky counties, bids to be advertised as soon as plans are completed.

CANTON, O.—United Furnace Co. has been incorporated; $2,000,000 capital stock; by H. G. Dalton, Henry S. Pickands, Ed. Langenbach, Harry R. Jones and E. L. Hang.

CINCINNATI.—M. Manton, of France, is in Cincinnati endeavoring to place $45,000 worth of lathes for immediate delivery to Europe.

CINCINNATI.—John Flynn, Cincinnati, is seeking a location for a machine shop that will employ about 75 men. Machinery requirements will not be determined until a suitable plant has been secured.

CINCINNATI.—Equipment is being purchased for the proposed plant of the Stacey Bros.' Gas Construction Co. at Elmwood Place. Harry Hake, architect, is in charge of construction.

CINCINNATI. — Luxury Shock Absorber Co. has been incorporated to manufacture a shock absorber for automobiles and other vehicles; $50,000 capital stock; by Morris Herzog, Henry Leiser, F. B. Thomilson, Frank King and Charles Snyder.

CINCINNATI.—Estimates on the first building for the Tubular Products & Steel Works Co., of Pittsburgh, which will move to Reading, a suburb of this city, will be received in about 90 days. The building will be 100 x 300 feet, and will be followed shortly by another of the same size. The company has a capitalization of $750,000.

CLEVELAND. — Euclid-Seventieth Co. will start work shortly on a $100,000, 6-story, fireproof warehouse.

CLEVELAND.—Johnston-Jennings Co. will erect a $5,000 foundry at Addison road and New York Central tracks.

CLEVELAND. — Bids will be received shortly by the Chandler Motor Car Co. for an $108,000 plant addition; Ernest McGeorge, architect.

CLEVELAND.—Cleveland Wire Spring Co. will erect an addition to the plant at Hamilton avenue and East Thirty-eighth street. Ralph M. Hulett, architect.

CLEVELAND.—Federal Lime & Stone Co. has been incorporated; $150,000 capital stock; by John D. Fackler, E. F. Gardner, Lawrence, Reuben and C. W. Hitchcock.

CLEVELAND.—Cleveland Horseless Farm Machinery Co. has been incorporated; $35,000 capital stock; by Oliver W. Johnson, J. H. Mosskell, M. J. Doolittle, J. H. Hodden, A. P. Schraner.

CLEVELAND.—Plans have been filed for the proposed $100,000, 8-story light manufacturing building to be erected at Lakeside avenue and West Third street for Harry J. Schlosser, Erie, Pa., and others. Richard Irvin, architect, Pittsburgh.

CLEVELAND.—Commissioner of purchases and supplies will receive separate bids until noon, Aug. 4 for 42-inch riveted steel pipe for the water division, one locomotive crane for the water division and for additional steel work for the Division avenue pumping station.

CLEVELAND.—Cleveland Railway Co. will start work shortly on the erection of four buildings at Denison avenue and Seventy-second street, including a $40,000 office building, $3,500 repair shop, $6,500 boiler and pump house, and a $3,000 foundry. W. I. Thompson is contractor.

CLEVELAND.—It is reported the National Engineering Co., Marshall building, has prepared plans for a $25,000 automobile plant to contain about 25,000 square feet of space. The name of the new automobile company is withheld for the present. An acre and a half site, it is asserted, has been purchased at East Seventy-ninth street and Finney avenue, with long time options on additional ground for plant enlargements. The equipment is expected to cost about $25,000.

DAYTON, O.—Pennsylvania railroad has three plans ready for the proposed $200,000 steel bridge across the Miami river. The Pennsylvania will erect the bridge and divide the cost with the other railroads.

EAST PALESTINE, O.—McGraw Tire & Rubber Co. is letting contracts for preliminary work for proposed plant additions.

HUBBARD, O.—It is understood that an industrial interest, whose name is not announced, is obtaining options on a tract of land adjacent to the property of the Andrews & Hitchcock Iron Co.

TROY, O.—C. H. & D. railroad engineers are preparing preliminary surveys for a bridge over the canal and race.

WARREN, O.—Cleveland, Alliance & Mahoning Valley railroad has secured a right of way from Leavittsburg, O., to Warren and has plans for an overhead bridge across the Erie and B. & O. railroad tracks at Mulberry street.

YOUNGSTOWN, O. — All-Steel Co. has been incorporated; $10,000 capital stock; by William H. Foster, R. M. Bell, John T. Harrington, L. B. Davenport and Richard B. Wilson.

YOUNGSTOWN, O.—Youngstown Sheet & Tube Co. has awarded the contract to Heller Bros., Youngstown, for the erection of a $175,000 hospital building. The company plans to build a $300,000 office building and a new $100,000 laboratory.

YOUNGSTOWN, O.—Youngstown Sheet & Tube Co. has awarded the McClintic-Marshall Co., Pittsburgh, contracts for erecting three bar mills, involving 3,000 tons of structural steel. James A. Campbell is president of the company.

YOUNGSTOWN, O.—Republic Iron & Steel Co., it is officially announced, has completed plans for building two additional open hearth furnaces and two tube mills at its plant at Lansingville, O. The improvements will entail an expenditure of $1,000,000. The company now had ten open hearth furnaces and four tube mills. Contracts for piling to be used under foundation of the open hearth furnaces, have been awarded the Raymond Concrete Pile Co., Youngstown, and the extensions to the building will be erected by the McClintic-Marshall Co., Pittsburgh. A 2,400-kilowatt generator will be installed at the Hazelton plant of the company to provide necessary power to operate tube mills and furnaces. Thomas J. Bray is president of the company.

ASHLAND, KY.—A bond issue will be provided for the erection of a garbage incinerator.

HAZARD, KY. — Plans for establishing a $350,000 power plant for the service of coal mines within a large territory are being made by the Kentucky River Power Co., which is planning to take over the power plant of the Eastern Tennessee Coal Co. and enlarge it. A turbo-generator unit of large capacity will be installed. R. L. Cornell, Hazard, is in immediate charge of the project, which has the backing of West Virginia capitalists.

HICKMAN, KY.—Hickman Wagon Co. has contracted for the installation of electric motors and will be in the market for supplies from now on.

LOUISVILLE, KY.—James Clark Jr. Electric Co. is building an addition to its plant to be used principally for storage purposes.

FORT WAYNE, IND—R. H. Fitch is building a garage 65 x 175 feet to cost $10,000 A. M. Strauss, 302 Bank building, is architect.

INDIANAPOLIS.—Grapho-Metal Mfg. Co. has been incorporated to manufacture machinery; $200,000 capital stock; by A. H. Schleagel, Frank Fitton and W. A. Bristor.

CHICAGO.—Nochils Valve Co. has been

incorporated; $10,000 capital stock; by Harry Bierms, Elmer E. Schmuck and George W. Ingrish, 3307 Belden avenue.

CHICAGO.—Tur-Blow Manufacturing Co. has been incorporated; $5,500 capital stock; by R. J. Montgomery, James E. Blow and Thomas A. Soper, 5340 South Michigan avenue.

PEORIA, ILL.—E. F. Hunter is interested in an electric railway to be built from Peoria to Chillicothe at a cost of $500,000.

ALBION, MICH.—Albion Spring & Wire Co. is building an addition to cost about $60,000. The Canadian plant owned by this company at Windsor, Ont., is to be doubled.

COLDWATER, MICH.—Board of public works plans to buy a 350 kilowatt generator and engine. K. C. Norton is superintendent.

DETROIT.—McLaren Mfg. Co. has been incorporated to manufacture machinery and screw machine specialties; $25,000 capital stock; by John P. McLaren, Waldo C. Brown and Harry E. Andrews.

DETROIT.—Abbott Stamping Co. has been incorporated to manufacture steel stampings and enamel work; $6,000 capital stock; by Charles S. Abbott, B. B. Bebbet and F. B. Boileau.

GRAND RAPIDS, MICH.—Campau Square Building Co. plans to erect a $500,000, 10-story steel fireproof building for use as a furniture exhibition structure.

ST. JOSEPH, MICH.—St. Joseph Development Co. is erecting a $7,500 building for the Engberg Electrical Works.

BELOIT, WIS.—Thompson Plow & Engine Co. has been organized with $25,000 capital stock by O. T. Thompson and A. S. Thompson and is preparing to engage in the manufacture of farm implements and machinery. The promoters were formerly interested in the J. Thompson's Sons Mfg. Co., of Beloit, which retired from business about two years ago after being engaged in the farm implement manufacturing business for many years.

MILWAUKEE. — Milwaukee Heating Co. has been incorporated; $6,000 capital stock; by Lynn S. Pease, W. F. Mayer and Adelaide M. Aldrich.

CHILLICOTHE, MO.—Plans have been completed for a bridge containing two 60-foot and one 80-foot spans and also four reinforced concrete bridges from 30 to 50-foot spans.

ST. JOSEPH, MO.—A $75,000 bond issue has been recommended for the purpose of duplicating the electrical generating machinery in the municipal electric plant. The present power station is sufficiently large to accommodate it.

ST. LOUIS.—St. Louis Iron & Dock Co. has been incorporated to build and operate 25 miles of railway in the city and county of St. Louis; $250,000 capital stock. W. J. Holbrook and E. W. Bannister, of St. Louis are interested.

DULUTH, MINN.—Langdon Briquette Co. has been incorporated to build machinery to make coal dust briquets; $750,000 capital stock. James D. Brown, Minneapolis, is interested.

HALLOCK, MINN.—City council is considering plans for a $10,000 municipal electric plant.

SOUTHERN STATES

RICHMOND, VA.—Kline Motor Car Co. is installing equipment for the manufacture of high explosive shells.

MISSION, TEX.—Mission Ice, Light & Water Co. has been incorporated; $20,000 capital stock; by J. A. Sadler, G. L. Jones, J. P. McEvoy.

SMITHVILLE, TEX.—Missouri-Kansas & Texas railroad is planning to build a round house at Smithville.

LITTLE ROCK, ARK.—County Interurban & Intercity Traction Co. and citizens are making plans for a new superstructure for a bridge with 32-foot roadway and 6-foot concrete walks, creosote block paving.

BELLEBUCKLE, TENN. — A bond issue for the erection of a water works has been defeated.

KNOXVILLE, TENN. — William J. Oliver Co., which has taken a contract for manufacturing shells for the British government, will add a large amount of machinery.

MEMPHIS, TENN. — Continental Piston Ring Co., equipping a plant as previously reported, will require electric motors for the operation of its automatic machinery. The company will buy gray iron castings in large quantities.

NASHVILLE, TENN.—Ford Motor Co. is selecting a site for the erection of a reinforced concrete assembling plant in Nashville, which will be equipped to handle 15,000 cars a year. Building and machinery contracts will be let at the Detroit office.

CHICKASHA, OKLA.—Chickasha Foundry & Machine Co. is building a $20,000 foundry

CLEVELAND, OKLA.—A movement is on foot to establish a water works system costing $75,000. Daniel Hollet is city clerk.

TULSA, OKLA.—Contract will be awarded about Sept. 1 for a $200,000 bridge between Tulsa and West Tulsa.

Well, How About It?

There's lots doing in the machine tool trade, Mr. Dealer, BUT—
Are YOU getting yours?
If not,
Look over these tips, as your competitor does,
EACH WEEK.

Taft-Peirce Mfg. Co., Woonsocket, R. I., is inquiring for a considerable quantity of equipment for its proposed plant additions.

Eyon-Evans Mfg. Co., Philadelphia, are receiving bids for a 3-story foundry and machine shop, 50 x 120 feet, with a wing, 58 x 120 feet.

Wm. Cramp & Sons Ship Building Co., Philadelphia, is in the market for four electric traveling cranes, each having a capacity of 10 tons, with a 150-foot span.

Pittsburgh Valve, Foundry, & Construction Co., Pittsburgh, is in the market for a large quantity of equipment for manufacturing shrapnel.

Pennsylvania Steel Co., Camden, N. J., is figuring on a shrapnel contract and is inquiring for the necessary machine tool equipment.

Reeves-Gubberly Engine Co., Trenton, N. J., is in the market for about 20 lathes for manufacturing shrapnel.

Ford Motor Co., Detroit, will be in the market shortly for a large quantity of equipment for proposed extensions to its assembling plant at Pittsburgh.

William J. Oliver Co., Knoxville, Tenn., will add a large amount of machinery for the manufacture of shells.

WESTERN STATES

FT. YATES, N. D.—Bids will be received until Aug. 10 for two steel bridges. A. Colville is auditor.

ABERDEEN, S. D.—The city is planning a $32,000 bridge over Chester Creek. A. Simonson may be addressed for details.

MITCHELL, S. D.—Mitchell Street Car & Interurban Railway Co. has been incorporated to build an electric railway in Mitchell. A. N. Hill, Mitchell, is interested.

ORD, NEB.—Bids will be received until Aug. 13 by J. C. North, mayor, for the construction of a water works system on plans by Bruce, Standeven & Boynton, Bee building, Omaha, engineers.

ST. PAUL, NEB.—The county commissioners have asked the city to build a $50,000, 800-foot steel bridge over Middle Loup river, the county to pay half. State Engineer Johnson, Lincoln, Neb., will prepare plans.

ELLINWOOD, KAS.—Bids will be received about Sept. 1 for a reinforced concrete bridge containing nine spans 44 feet long and 24 foot roadway. W. G. Gearhart, Manhattan,

EVEREST, KAS.—Bonds for $8,000 have been voted for an electric light system.

SOMERSET, KAS.—Pulaski county commissioners are considering the construction of a 110-foot span over Fishing Creek at Somerset.

BILLINGS, MONT. — Billings Foundry & Mfg. Co. has awarded the general contract for the erection of a $10,000 building to Edgar E. Kringlen.

GLASGOW, MONT.—This city will vote soon on $20,000 bonds for installing a 225-horsepower oil engine and a 160-kilowatt generator.

MISSOULA, MONT.—An election will be held Aug. 3 on the question of issuing $500,000 in bonds for a water works system.

SALT LAKE CITY.—Salt Lake Security & Trust Co. is planning to erect a 17-story building on the site of the Utah State National Bank building. F. E. Gurrin is president.

MULLAN, IDA.—Directors of the Reindeer Queen mine are making arrangements for building a 150-ton mill.

ST. MARIES, IDA.—Plans are being prepared for a $30,000 water works system. Charles R. Schulte is city clerk.

OLYMPIA, WASH.—State Highway commissioner will receive bids until 2 p. m., Aug. 9 for a 195-foot, steel riveted truss bridge over the Skokomish river in Mason county.

PATEROS, WASH. — Bonds for $10,000 have been voted for a water works system and bids will be received until July 30 for construction. W. H. Noble is town engineer.

STANWOOD, WASH.—George Kunze, Arlington, Wash., will erect an electrically-driven sawmill in Stanwood if a power and light franchise are granted by Stanwood.

TACOMA, WASH.—Friddle Motor Co. is considering erecting a $50,000 factory in Tacoma. James A. Friddle and C. P. Gammon are interested.

BEND, ORE.—L. W. Ellis, Ann Arbor, Mich., is to build an experimental plant at Bend for the production of aluminum.

PORTLAND, ORE.—Morgan Razor Co., of New York, is planning to build a factory at Portland to manufacture razors. J. Canby Morgan is president.

SUSANVILLE, ORE.—Fred Shank reports reduction works or plant will be installed at the Chattanooga mine near Susanville.

ALAMEDA, CAL.—Frank Bartlett is interested in the movement to build a $700,000 bridge at Webster street.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to Dec. 31.)

Bessemer, valley	$14.00
Bessemer, Pittsburgh	14.95
Basic, Pittsburgh	13.95
Basic, eastern Pa.	14.25
Malleable, Pittsburgh	13.70 to 13.95
Malleable foundry, Chicago	13.00
Malleable foundry, Philadelphia	15.00 to 15.25
Malleable foundry, Buffalo	13.00
No. 1X foundry, Philadelphia	14.75 to 15.00
No. 2 foundry, Pittsburgh	13.70 to 13.95
No. 2 foundry, valley	12.75 to 13.00
No. 2 foundry, Cleveland	13.50
No. 2 foundry, Ironton	13.00 to 13.50
No. 2 foundry, Chicago	13.00
No. 2X foundry, Philadelphia	14.50 to 14.75
No. 2X fdy., N. J. tidewater	14.50 to 14.75
No. 2X foundry, Buffalo	13.00
No. 2 plain, Philadelphia	14.25 to 14.50
No. 2 plain, N. J. tidewater	14.25 to 14.50
No. 2 plain, Buffalo	12.50 to 12.75
No. 2 southern, Birmingham	10.00 to 10.50
No. 1 southern, Cincinnati	12.90 to 13.40
No. 2 southern, Chicago	13.50 to 14.00
No. 2 southern, Phila. delivery	14.00 to 14.25
No. 2 southern, Cleveland	13.50 to 14.00
No. 2 south'n, New York docks	13.75 to 14.00
No. 2 southern Boston, docks	13.75 to 14.00
No. 2 south. interior, New Eng.	14.50 to 15.50
No. 2 southern, St. Louis	13.40
Virginia No. 2X furnace	12.50 to 13.00
Virginia 2X, Philadelphia	15.25
Virginia 2X, Jersey City	15.50
Virgina 2X, Boston points	15.75
Gray forge, eastern Pa.	13.25 to 13.50
Gray forge, Pittsburgh	13.20 to 13.45
Gray forge, Birmingham	8.75 to 9.00
Silveries, 8 per cent, Jackson, O.	15.00 to 15.25
Silveries, 5 per cent Birmingham	12.50
Silveries, 5 per cent, Chicago	16.35
Standard low phos., Phil.	21.50 to 21.75
Lebanon low phos., furnace	16.50 to 17.00
Low phos., Pittsburgh	20.95 to 21.20
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16.25
Charcoal, Buffalo	15.75 to 17.00
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.45
Old range, non-Bess., 51½ per cent	3.00
Mesabi non-Bessemer, 51½ per cent	2.80

FOREIGN ORES

(Per unit Philadelphia.)
(Prices nominal.)

Foreign Bess., 50 to 65 per cent	8 to 8½c
For'n non-Bes., 50 to 65 per cent	8 to 8½c

COKE

(At the ovens)

Connellsville furnace	$1.70 to 1.80
Connellsville fur. contr.	1.75 to 1.80
Connellsville furnace coke, fourth quarter	1.75
Connellsville foundry	2.00 to 2.50
Connellsville fdy. contr.	2.25 to 2.60
Wise county furnace	1.75 to 2.00
Wise county foundry	2.25 to 2.50
Pocahontas furnace	1.75 to 2.00
Pocahontas foundry	2.00 to 2.25
New River, foundry	2.50 to 3.25
New River, furnace	2.00 to 2.25

FERRO-ALLOYS

Ferro mang., furnace (prompt)	$95 to 100
Ferro mang., Balti. (future)	95 to 100
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent.	18.00 to 18.50
Ferro-sil., 11 to 12 per cent.	17.00 to 17.50
Ferro-sil., 10 to 11 per cent.	16.00 to 16.50
Ferro-sil., 9 to 10 per cent.	15.00 to 15.50
(Ferro-silicon quoted at furnace Ashland, Jackson and New Straitsville.)	
Ferro-carbon titanium, carloads, per lb.	8c to 12½c
Ferro vanadium, Pbgh. per lb. alloy	$2.25
Ferro tungsten, per lb. of alloy	2.50
Ferro chrome, per lb., Niagara Falls	20c

SEMI-FINISHED STEEL

Open hearth billets, Phila.	$25.06
Forging billets, Phila.	29.00 to 30.00
Forging billets, Pbgh.	28.00 to 29.00

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.45
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

Wire rods, Pittsburgh	$26.00
Bess. bill., Youngstown	21.00
Open hearth billets, Youngstown	21.50
Bessemer billets, Pittsburgh	22.00
Open hearth billets, Pittsburgh.	22.50 to 23.00
Bess. sheet bars, Youngstown	21.50 to 22.00
Op. h'th sheet bars, Youngstown	22.50 to 23.00
Bess. sheet bars, Pittsburgh	21.50
Op. h'th sh. bars, Pbgh.	24.00
Muck bar, Pittsburgh	27.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Lgt. rails, 8-lbs., Pbgh. & Chgo.	1.22c
Lgt. rails, 12 lbs. Pbg. & Chgo.	1.17c
Lgt. rails, 16 to 20 lbs., Pgh. & Chgo.	1.12c
Lgt. rails, 25 to 45 lbs., Pbgh. and Chgo.	1.07c
Relaying rails, standard, Pbg. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect, Pbgh. base.	1.50c
Angle bars, st. sections, Chicago	1.50c
Spikes, railroad, Pbgh.	1.40c
Spikes, railroad, Chgo.	1.50c to 1.55c
Track bolts, Pbgh.	1.95c to 2.00c
Track bolts, Chgo.	2.00c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	3.00
New England	3.00
Philadelphia	2.79
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.00 to 1.50
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago, to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.47
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.30c
Structural shapes, Chicago	1.49c
Structural shapes, Philadelphia	1.409c to 1.459c
Structural shapes, New York	1.419c to 1.469c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.44c to 1.49c
Tank plates, Pittsburgh	1.30c
Tank plates, Philadelphia	1.409c to 1.459c
Tank plates, New York	1.419c to 1.469c
Bars, soft steel, Pittsburgh	1.30c
Bars, soft steel, Chicago	1.49c
Bars, soft steel, Philadelphia	1.409c
Bars, soft steel, New York	1.469c
Hoops, carloads, Pittsburgh	1.30c
Bands, Pittsburgh	1.30c
Shafting, Pbgh., contr.	65 to 66 off
Bar iron, Chicago	1.20c
Bar iron, Philadelphia	1.22c to 1.27c
Bar iron, New York	1.20c to 1.25c
Bar iron, Cleveland	1.20c to 1.25c
Bar iron, Pittsburgh	1.25c to 1.30c
Hard steel bars, Chicago	1.20c to 1.25c
Smooth finish, mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.75c to 1.80c
No. 28, black, Chicago	1.99c
No. 28, tin mill, black, Pbgh.	1.80c to 1.85c
No. 28, galvanized, Pbgh.	4.25c to 4.75c
No. 28, galvanized, Chgo., nom.	
No. 10, blue, anld., Pbgh.	1.35c to 1.40c
No. 10, blue, annealed, Phila.	1.559c to 1.609c
Tin plate, 100 lb., coke base.	3.10c to 3.20c

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll, and re-anl.	30 cents
Hot roll'd pick'd and anl., tin mill	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squarring	10 cents
Roller leveling	10 cents
Patent leveling and re-squarring	35 cents
Oiling sheets	10 cents
Deoxidizing	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free from mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black.	Galv.
	Butt-weld.	
Steel, ¾ to 3 inches	79	57½
Iron, ¼ to 2½ inches	71	46
	Lap-weld.	
Steel, 2½ to 6 inches	78	62½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	72
Iron, 3½ to 4½ inches l. c. l.	61

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

Wire nail jobbers, Pittsburgh	$1.60
Plain wire, jobbers, Pittsburgh	1.40
Galvanized wire, jobbers, Pbgh.	2.20
Polished staples, Pbgh.	1.70
Galvanized staples, Pbgh.	2.50
Barb wire, painted, jobbers, Pbgh.	1.70
Barb wire, galv., jobbers, Pbgh.	2.50